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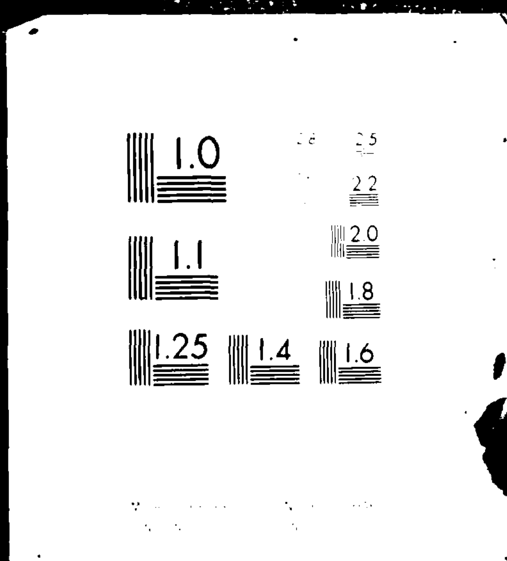

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MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

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VERIFICATION STUDY
PINE VALLEY, UTAH
VOLUME II - GEOTECHNICAL DATA

PREPARED FOR
BALLISTIC MISSILE OFFICE (BMO)
NORTON AIR FORCE BASE, CALIFORNIA

FUGRO NATIONAL, INC.
Consulting Engineers and Geologists

MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

VERIFICATION STUDY - PINE VALLEY
UTAH

VOLUME II - GEOTECHNICAL DATA

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, California 92409

Prepared by:

Fugro National, Inc.
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Long Beach, California 90807

24 March 1981

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report contains the field data + laboratory tests from the verification investigation of Pine Valley.

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FOREWORD

This volume of geotechnical data was compiled for the Department of the Air Force, Ballistic Missile Office (BMO), in compliance with Contract No. F04704-80-C-0006, CDRL Item 004A6. It contains the field data and laboratory test results from the Verification investigation of Pine Valley. A synthesis of these data are available in Volume I (FN-TR-27-PI-I).

The data in each section of this volume are preceded by an explanation of the format and terms used in the compilation.

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1.0 ACTIVITY MAP AND GEOLOGIC STATION DATA

Explanation:

Locations of all field investigations are shown in Drawing II-1-1, Activity Location Map (in pocket). The geodetic and Universal Transverse Mercator (UTM) coordinates of all activities are listed in Table II-1-1.

Geologic stations were established at selected locations throughout the valley at which detailed descriptions of surficial basin-fill deposits or rock were recorded. All data taken on surficial basin-fill units at the geologic stations are listed in Table II-1-2, and an explanation of the column headings in the table is given below. An example of the field data sheet is shown on Figure II-1-1. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification studies is included at the end of this section.

Column Heading Table II-1-2	Explanation
Station Number	Geologic stations are numbered sequentially (e.g., NPIG001; N = Nevada-Utah study area; PI = Valley abbreviation [Pine]; G = Geology Station).
Geol. Unit	Generalized mapped geomorphic unit (see explanation below). The grain-size designations (s, g, and f) indicate sand, gravel, and fines, respectively.
MPS (mm)	Average Maximum Particle Size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S), and fines (%F)

are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter. Note: The symbol Ø (occasional) indicates between 1 and 5 percent; zero indicates 0 to 1 percent.

*	Laboratory analyses of selected soil samples using the Unified Soil Classification System.
USCS	Soil class according to the Unified Soil Classification System.
Munsell Color	Soil color based on standard Munsell Soil Color Charts.
Source Rock Types	Rock types of coarse clasts (gravel) listed in order of abundance.
Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table II-1-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.

6	(Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well Rounded
7	(Moisture Content)	1) Dry, 2) Slightly Moist, 3) Moist, 4) Very Moist, 5) Wet
8	(Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9	(Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense Fine grained: 1)Soft, 2) Firm, 3) Stiff, 4) Hard
10	(Structure)	1) Nonstratified, 2) Stratified, tabular, 3) Stratified, other (lensed, cross bedded, discontinuous beds)
11	(Cementation-Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12	(Depth to Cemented Layer)	Depth to layer (in centimeters) exhibiting cementation-induration described in Column 11 (above)

13 (Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14 (Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
15 (Caliche Development)	1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV
Terrain	Terrain information at the data location is broken into the following categories:
Drainage Depth (ft)	Average depth of drainages (in feet)
Drainage Width (ft)	Average width of drainages (in feet)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major recent stream channel and flood plain deposits.

A2 Older Fluvial Deposits - Older incised stream-channel and flood-plain deposits in elevated terraces bordering major recent drainages. Note: Not mapped in Delamar Valley.

A3 Eolian Deposits - Windblown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).

A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).

A5 Alluvial Fan Deposits - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, or g) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System.

f - fine-grained clays and silts (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated). Rocks formed by solidification of a molten or partially molten mass.

I1 Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).

I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic compositon formed by solidification of molten material at or near the surface (e.g., rhyolite, latite, dacite, andesite).

I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).

I4 Extrusive (pyroclastic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids, and/or chemically precipitated minerals.

S1 Arenaceous and/or Siliceous Rocks - Composed of sand-size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).

S2 Carbonate Rocks - Composed predominantly of calcium carbonate detritus or chemical precipitates (e.g., limestone, dolomite, chalk).

S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).

S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).

S5 Coarse Clastic Rocks - Composed of gravel-sized or larger clasts (e.g., conglomerate, breccia).

M Metamorphic (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
BORING SITES						
PI- B01	38	43.37	113	40.44	4289.21	267.53
PI- B02	38	30.48	113	43.93	4265.50	261.76
PI- B03	38	12.93	113	43.46	4233.03	261.48
PI- B04	38	12.79	113	44.35	4232.81	260.18
PI- B05	38	11.15	113	42.40	4229.70	262.94
PI- B06	38	19.32	113	43.72	4244.87	261.45
PI- B07	38	25.34	113	44.53	4256.02	260.60
PI- B08	38	40.41	113	39.09	4283.67	269.32
PI- B09	38	33.90	113	39.10	4271.63	268.96
PI- B10	38	31.69	113	40.45	4267.61	266.88
PI-WRT4	38	34.15	113	44.16	4272.31	261.63
PI-WR04	38	34.15	113	44.16	4272.31	261.63
CPT SITES						
PI- C01	38	44.95	113	41.48	4292.17	266.11
PI- C02	38	44.16	113	40.44	4290.66	267.57
PI- C03	38	43.37	113	40.44	4289.21	267.53
PI- C04	38	43.73	113	39.70	4289.84	268.63
PI- C05	38	33.85	113	36.30	4271.42	273.03
PI- C06	38	33.98	113	37.18	4271.69	271.76
PI- C07	38	34.03	113	38.06	4271.82	270.48
PI- C08	38	33.90	113	39.10	4271.63	268.96
PI- C09	38	33.99	113	40.04	4271.84	267.61
PI- C10	38	40.81	113	38.13	4284.37	270.74
PI- C11	38	40.41	113	39.09	4283.67	269.32
PI- C12	38	39.75	113	39.75	4282.49	268.34
PI- C13	38	39.04	113	40.34	4281.19	267.44
PI- C14	38	38.49	113	41.09	4280.22	266.32
PI- C15	38	34.12	113	41.54	4272.13	265.43
PI- C16	38	21.29	113	39.60	4248.33	267.57
PI- C17	38	21.83	113	40.26	4249.35	266.63
PI- C18	38	22.35	113	41.55	4250.38	264.78
PI- C19	38	22.26	113	42.72	4250.26	263.07
PI- C20	38	21.29	113	42.98	4248.47	262.64
PI- C21	38	19.98	113	42.74	4246.04	262.92
PI- C22	38	19.32	113	43.72	4244.87	261.45
PI- C23	38	18.59	113	44.37	4243.53	260.46
PI- C24	38	17.90	113	45.17	4242.30	259.26

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
1 OF 9

FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI- C25	38	17.48	113	45.83	4241.54	258.28
PI- C26	38	17.06	113	46.63	4240.81	257.08
PI- C27	38	15.65	113	38.21	4237.84	269.29
PI- C28	38	15.43	113	39.26	4237.47	267.75
PI- C29	38	15.20	113	40.24	4237.09	266.30
PI- C30	38	14.98	113	41.07	4236.71	265.09
PI- C31	38	12.87	113	40.19	4232.77	266.25
PI- C32	38	12.63	113	39.26	4232.29	267.60
PI- C33	38	12.07	113	38.23	4231.21	269.07
PI- C34	38	12.75	113	40.97	4232.58	265.11
PI- C35	38	12.00	113	41.72	4231.24	263.97
PI- C36	38	11.15	113	42.40	4229.70	262.94
PI- C37	38	10.10	113	42.55	4227.75	262.65
PI- C38	38	9.61	113	43.20	4226.88	261.69
PI- C39	38	9.07	113	44.20	4225.93	260.19
PI- C40	38	12.45	113	46.04	4232.26	257.70
PI- C41	38	12.75	113	45.35	4232.78	258.72
PI- C42	38	12.79	113	44.35	4232.81	260.18
PI- C43	38	12.93	113	43.46	4233.03	261.48
PI- C44	38	13.62	113	43.11	4234.28	262.04
PI- C45	38	14.37	113	42.76	4235.66	262.58
PI- C46	38	14.85	113	42.05	4236.52	263.64
PI- C47	38	21.47	113	52.86	4249.24	248.27
PI- C48	38	22.16	113	52.15	4250.49	249.34
PI- C49	38	21.80	113	51.35	4249.79	250.48
PI- C50	38	22.11	113	49.06	4250.25	253.84
PI- C51	38	22.92	113	47.90	4251.71	255.57
PI- C52	38	23.31	113	47.37	4252.40	256.36
PI- C53	38	23.91	113	46.50	4253.48	257.66
PI- C54	38	24.64	113	45.42	4254.77	259.27
PI- C55	38	25.34	113	44.53	4256.02	260.60
PI- C56	38	25.84	113	43.77	4256.92	261.73
PI- C57	38	26.68	113	42.71	4258.43	263.33
PI- C58	38	27.90	113	41.96	4260.65	264.49
PI- C59	38	28.58	113	40.87	4261.87	266.11
PI- C60	38	30.44	113	42.69	4265.38	263.56
PI- C61	38	30.48	113	43.93	4265.50	261.76
PI- C62	38	30.52	113	41.58	4265.49	265.18
PI- C63	38	30.46	113	44.47	4265.50	260.97
PI- C64	38	30.37	113	45.70	4265.39	259.18
PI- C65	38	30.03	113	46.69	4264.81	257.73
PI- C66	38	30.06	113	47.69	4264.89	256.28

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
2 OF 9

FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI- C67	38	29.74	113	48.45	4264.34	255.15
PI- C68	38	29.15	113	48.98	4263.28	254.35
PI- C69	38	34.98	113	49.09	4274.07	254.51
PI- C70	38	34.73	113	48.09	4273.56	255.95
PI- C71	38	34.47	113	47.07	4273.02	257.42
PI- C72	38	34.08	113	46.15	4272.27	258.74
PI- C73	38	33.75	113	45.33	4271.62	259.91
PI- C74	38	33.37	113	44.36	4270.89	261.29
PI- C75	38	32.94	113	43.35	4270.03	262.74
PI- C76	38	31.13	113	39.02	4266.51	268.94
PI- C77	38	32.15	113	41.51	4268.50	265.36
PI- C78	38	31.69	113	40.45	4267.61	266.88
PI- C79	38	30.83	113	38.20	4265.92	270.11
PI- C80	38	30.44	113	37.32	4265.15	271.37
PI- C81	38	30.27	113	35.67	4264.78	273.76
PI- C82	38	30.08	113	36.45	4264.45	272.62
PI- C83	38	29.78	113	37.39	4263.94	271.24
PI- C84	38	29.55	113	38.06	4263.55	270.24
PI- C85	38	29.23	113	38.97	4262.99	268.90
PI- C86	38	28.88	113	40.02	4262.39	267.36
GEOLOGIC STATIONS						
PI-GS01	38	45.85	113	38.09	4293.69	271.07
PI-GS02	38	45.74	113	41.53	4293.63	266.08
PI-GS03	38	43.96	113	39.27	4290.25	269.25
PI-GS04	38	42.08	113	40.88	4286.84	266.83
PI-GS05	38	40.66	113	38.90	4284.13	269.61
PI-GS06	38	42.28	113	38.01	4287.10	270.99
PI-GS07	38	42.81	113	37.78	4288.06	271.36
PI-GS08	38	44.29	113	37.81	4290.80	271.39
PI-GS09	38	35.26	113	47.21	4274.50	257.26
PI-GS10	38	34.15	113	46.14	4272.40	258.75
PI-GS11	38	34.20	113	44.48	4272.43	261.17
PI-GS12	38	34.18	113	41.58	4272.26	265.38
PI-GS13	38	37.67	113	41.57	4278.71	265.58
PI-GS14	38	38.70	113	40.78	4280.58	266.79
PI-GS15	38	32.99	113	38.70	4269.93	269.50
PI-GS16	38	34.61	113	39.19	4272.94	268.87
PI-GS17	38	38.00	113	38.12	4279.17	270.60
PI-GS18	38	39.51	113	39.84	4282.04	268.20
PI-GS19	38	33.84	113	36.74	4271.43	272.39

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
3 OF 9

FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	LAT. MIN	LONG. DEG	LONG. MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI-GS20	38	30.58	113	37.22	4265.42	271.53
PI-GS21	38	30.39	113	36.13	4265.02	273.09
PI-GS22	38	31.46	113	37.11	4267.04	271.73
PI-GS23	38	33.18	113	37.19	4270.22	271.70
PI-GS24	38	31.33	113	39.22	4266.88	268.65
PI-GS25	38	33.41	113	46.84	427 06	257.69
PI-GS26	38	33.27	113	46.47	4270.78	258.22
PI-GS27	38	32.69	113	46.37	4269.71	258.34
PI-GS28	38	32.38	113	49.68	4269.27	253.52
PI-GS29	38	31.04	113	48.74	4266.76	254.80
PI-GS30	38	28.87	113	49.24	4262.77	253.95
PI-GS31	38	27.03	113	49.31	4259.37	253.75
PI-GS32	38	31.00	113	47.59	4266.64	256.47
PI-GS33	38	28.44	113	47.45	4261.90	256.53
PI-GS34	38	26.85	113	51.06	[illegible]9.12	251.20
PI-GS35	38	24.87	113	50 7[illegible]	[illegible]5.43	251.56
PI-GS36	38	32.97	113	4[illegible].7[illegible]	[illegible]7[illegible].11	262.12
PI-GS37	38	31.64	113	3[illegible] [illegible]	[illegible]267 48	267.55
PI-GS38	38	34.60	113	49.[illegible]	[illegible]273.36	254.63
PI-GS39	38	34.41	113	49 [illegible]	4273.03	253.54
PI-GS40	38	31.42	113	[illegible].7[illegible]	4267.28	260.62
PI-GS41	38	30.43	113	41.98	4265.33	264.59
PI-GS42	38	28.49	113	41.73	4261.73	264.85
PI-GS43	38	27.95	113	43 97	4260.83	261.56
PI-GS44	38	27.65	113	45.38	4260.33	259.50
PI-GS45	38	26.18	113	48.78	4257.77	254.47
PI-GS46	38	26.08	113	49.31	4257.61	253.69
PI-GS47	38	24.39	113	48.60	4254.46	254.63
PI-GS48	38	28.30	113	41.27	4261.37	265.51
PI-GS49	38	26.33	113	44.94	4257.89	260.06
PI-GS50	38	22.34	113	48.72	4250.66	254.34
PI-GS51	38	20.35	113	47.60	4246.94	255.86
PI-GS52	38	19.23	113	46.32	4244.81	257.66
PI-GS53	38	17.07	113	47.12	4240.85	256.38
PI-GS54	38	19.95	113	42.24	4245.95	263.65
PI-GS55	38	20.41	113	38.41	4246.65	269.25
PI-GS56	38	23.23	113	41.20	4251.98	265.34
PI-GS57	38	27.82	113	37.93	4260.34	270.34
PI-GS58	38	25.94	113	38.48	4256.89	269.45
PI-GS59	38	26.09	113	37.15	4257.10	271.39
PI-GS60	38	25.98	113	37.03	4256.90	271.55
PI-GS61	38	24.62	113	37.89	4254.41	270.24

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI-GS62	38	23.15	113	38.60	4251.72	269.12
PI-GS63	38	15.67	113	37.98	4237.87	269.62
PI-GS64	38	14.25	113	38.24	4235.24	269.18
PI-GS65	38	11.82	113	38.16	4230.75	269.16
PI-GS66	38	12.47	113	47.11	4232.33	256.13
PI-GS67	38	8.76	113	44.84	4225.38	259.24
PI-GS68	38	25.73	113	41.64	4256.63	264.83
PI-GS69	38	21.08	113	41.13	4248.00	265.32
PI-GS70	38	21.06	113	40.41	4247.93	266.38
PI-GS71	38	5.93	113	39.13	4219.91	267.44
PI-GS72	38	16.39	113	41.36	4239.34	264.74
PI-GS73	38	6.14	113	38.72	4220.27	268.04
PI-GS74	38	8.88	113	38.57	4225.32	268.41
PI-GS75	38	15.73	113	42.63	4238.18	262.85
PI-GS76	38	9.76	113	38.99	4226.97	267.85
PI-GS77	38	21.09	113	44.46	4248.17	260.48
PI-GS78	38	12.86	113	42.10	4232.84	263.46
PI-GS79	38	24.63	113	43.53	4254.68	262.02
PI-GS80	38	20.92	113	49.87	4248.09	252.58
PI-GS81	38	21.33	113	52.47	4248.97	248.83
PI-GS82	38	28.89	113	44.75	4262.61	260.48
PI-GS83	38	41.22	113	37.69	4285.11	271.40
PI-GS84	38	9.69	113	43.96	4227.06	260.58
PI-GS85	38	8.39	113	41.14	4224.53	264.63
PI-GS86	38	34.95	113	48.10	4273.97	255.95
REFRACTION LINES						
PI- S01	38	43.37	113	40.44	4289.21	267.53
PI- S02	38	34.98	113	49.09	4274.07	254.51
PI- S03	38	32.42	113	49.06	4269.33	254.41
PI- S04	38	40.81	113	38.13	4284.37	270.74
PI- S05	38	33.98	113	37.18	4271.69	271.76
PI- S06	38	34.73	113	48.09	4273.56	255.95
PI- S07	38	29.15	113	48.98	4263.28	254.35
PI- S08	38	26.03	113	49.59	4257.53	253.27
PI- S09	38	27.34	113	45.65	4259.78	259.09
PI- S10	38	30.08	113	36.45	4264.45	272.62
PI- S11	38	30.44	113	37.32	4265.15	271.37
PI- S12	38	21.18	113	48.35	4248.51	254.82
PI- S13	38	22.11	113	49.06	4250.25	253.84
PI- S14	38	21.47	113	52.86	4249.24	248.27

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1

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FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI- S15	38	25.88	113	37.85	4256.75	270.36
PI- S16	38	21.29	113	39.60	4248.33	267.57
PI- S17	38	19.32	113	43.72	4244.87	261.45
PI- S18	38	16.96	113	47.04	4240.64	256.48
PI- S19	38	15.65	113	38.21	4237.84	269.29
PI- S20	38	14.07	113	38.61	4234.94	268.63
PI- S21	38	12.45	113	46.04	4232.26	257.70
PI- S22	38	12.07	113	38.23	4231.21	269.07
PI- S23	38	22.92	113	47.90	4251.71	255.57

RESISTIVITY LINES

PI- R01	38	43.37	113	40.44	4289.21	267.53
PI- R02	38	34.98	113	49.09	4274.07	254.51
PI- R03	38	32.42	113	49.06	4269.33	254.41
PI- R04	38	40.81	113	38.13	4284.37	270.74
PI- R05	38	33.98	113	37.18	4271.69	271.76
PI- R06	38	34.73	113	48.09	4273.56	255.95
PI- R07	38	29.15	113	48.98	4263.28	254.35
PI- R08	38	26.03	113	49.59	4257.53	253.27
PI- R09	38	27.34	113	45.65	4259.78	259.09
PI- R10	38	30.08	113	36.45	4264.45	272.62
PI- R11	38	30.44	113	37.32	4265.15	271.37
PI- R12	38	21.18	113	48.35	4248.51	254.82
PI- R13	38	22.11	113	49.06	4250.25	253.84
PI- R14	38	21.47	113	52.86	4249.24	248.27
PI- R15	38	25.88	113	37.85	4256.75	270.36
PI- R16	38	21.29	113	39.60	4248.33	267.57
PI- R18	38	16.96	113	47.04	4240.64	256.48
PI- R19	38	15.65	113	38.21	4237.84	269.29
PI- R20	38	14.07	113	38.61	4234.94	268.63
PI- R21	38	12.45	113	46.04	4232.26	257.70
PI- R22	38	12.07	113	38.23	4231.21	269.07
PI- R23	38	22.92	113	47.90	4251.71	255.57

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
SURFICIAL SOIL SAMPLES						
PI-CS02	38	44.16	113	40.44	4290.66	267.57
PI-CS04	38	43.73	113	39.70	4289.84	268.63
PI-CS07	38	34.03	113	38.06	4271.82	270.48
PI-CS09	38	33.99	113	40.04	4271.84	267.61
PI-CS10	38	40.81	113	38.13	4284.37	270.74
PI-CS12	38	39.75	113	39.75	4282.49	268.34
PI-CS14	38	38.49	113	41.09	4280.22	266.32
PI-CS17	38	21.83	113	40.26	4249.35	266.63
PI-CS20	38	21.29	113	42.98	4248.47	262.64
PI-CS22	38	19.32	113	43.72	4244.87	261.45
PI-CS24	38	17.90	113	45.17	4242.30	259.26
PI-CS26	38	17.06	113	46.63	4240.81	257.08
PI-CS28	38	15.43	113	39.26	4237.47	267.75
PI-CS31	38	12.87	113	40.19	4232.77	266.25
PI-CS33	38	12.07	113	38.23	4231.21	269.07
PI-CS35	38	12.00	113	41.72	4231.24	263.97
PI-CS37	38	10.10	113	42.55	4227.75	262.65
PI-CS39	38	9.07	113	44.20	4225.93	260.19
PI-CS40	38	12.45	113	46.04	4232.26	257.70
PI-CS42	38	12.79	113	44.35	4232.81	260.18
PI-CS44	38	13.62	113	43.11	4234.28	262.04
PI-CS46	38	14.85	113	42.05	4236.52	263.64
PI-CS47	38	21.47	113	52.86	4249.24	248.27
PI-CS49	38	21.80	113	51.35	4249.79	250.48
PI-CS51	38	22.92	113	47.90	4251.71	255.57
PI-CS53	38	23.91	113	46.50	4253.48	257.66
PI-CS57	38	26.68	113	42.71	4258.43	263.33
PI-CS60	38	30.44	113	42.69	4265.38	263.56
PI-CS63	38	30.46	113	44.47	4265.50	260.97
PI-CS65	38	30.03	113	46.69	4264.81	257.73
PI-CS67	38	29.74	113	48.45	4264.34	255.15
PI-CS70	38	34.73	113	48.09	4273.56	255.95
PI-CS72	38	34.08	113	46.15	4272.27	258.74
PI-CS74	38	33.37	113	44.36	4270.89	261.29
PI-CS77	38	32.15	113	41.51	4268.50	265.36
PI-CS79	38	30.83	113	38.20	4265.92	270.11
PI-CS80	38	30.44	113	37.32	4265.15	271.37
PI-CS82	38	30.08	113	36.45	4264.45	272.62
PI-CS84	38	29.55	113	38.06	4263.55	270.24

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

PINE VALLEY ACTIVITY LOCATIONS

ACT ID.	GEODETIC COORD. LAT. DEG	MIN	LONG. DEG	MIN	UTM COORD. ZONE 12 N(KM)	E(KM)
PI-CS86	38	28.88	113	40.02	4262.39	267.36
TEST PITS						
PI- P01	38	44.95	113	41.48	4292.17	266.11
PI- P02	38	43.37	113	40.44	4289.21	267.53
PI- P03	38	34.98	113	49.09	4274.07	254.51
PI- P04	38	33.75	113	45.33	4271.62	259.91
PI- P05	38	32.94	113	43.35	4270.03	262.74
PI- P06	38	34.12	113	41.54	4272.13	265.43
PI- P07	38	39.04	113	40.34	4281.19	267.44
PI- P08	38	30.52	113	41.58	4265.49	265.18
PI- P09	38	30.37	113	45.70	4265.39	259.18
PI- P10	38	30.06	113	47.69	4264.89	256.28
PI- P11	38	27.90	113	41.96	4260.65	264.49
PI- P12	38	25.84	113	43.77	4256.92	261.73
PI- P13	38	24.64	113	45.42	4254.77	259.27
PI- P14	38	22.11	113	49.06	4250.25	253.84
PI- P15	38	19.98	113	42.74	4246.04	262.92
PI- P16	38	18.59	113	44.37	4243.53	260.46
PI- P17	38	22.27	113	40.61	4250.19	266.14
PI- P18	38	29.23	113	38.97	4262.99	268.90
PI- P19	38	29.78	113	37.39	4263.94	271.24
PI- P20	38	31.13	113	39.02	4266.51	268.94
PI- P21	38	15.20	113	40.24	4237.09	266.30
PI- P22	38	12.75	113	40.97	4232.58	265.11
PI- P23	38	12.63	113	39.26	4232.29	267.60
PI- P24	38	12.93	113	43.46	4233.03	261.48
PI- P25	38	14.37	113	42.76	4235.66	262.58
TRENCH SITES						
PI- T01	38	34.47	113	47.07	4273.02	257.42
PI- T02	38	40.41	113	39.09	4283.67	269.32
PI- T03	38	33.90	113	39.10	4271.63	268.96
PI- T04	38	33.98	113	37.18	4271.69	271.76
PI- T05	38	30.48	113	43.93	4265.50	261.76
PI- T06	38	29.15	113	48.98	4263.28	254.35
PI- T07	38	25.34	113	44.53	4256.02	260.60
PI- T08	38	23.31	113	47.37	4252.40	256.36
PI- T09	38	22.16	113	52.15	4250.49	249.34
PI- T10	38	17.48	113	45.83	4241.54	258.28

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE
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FUGRO NATIONAL, INC.

FN-TR-27-PI-II

PINE VALLEY ACTIVITY LOCATIONS

ACT ID	GEODETIC COORD LAT DEG	LAT MIN	LONG DEG	LONG MIN	UTM COORD ZONE 12 N KM	E KM
PI- T11	38	31 29	113	39 60	4249 33	261 57
PI- T12	38	28 58	113	41 87	4261 87	266 11
PI- T13	38	30 27	113	33 67	4264 78	271 76
PI- T14	38	31 47	113	40 45	4267 61	266 88
PI- T15	38	14 44	113	41 07	4236 71	265 19
PI- T16	38	15 65	113	38 21	4237 84	269 29
PI- T17	38	12 75	113	45 35	4232 78	258 72
PI- T18	38	11 15	113	42 40	4229 70	262 94
PI- T19	38	9 61	113	43 20	4229 66	261 69
WATER WELL SITES						
PI- W01	38	38 42	113	41 19	4281 38	266 18
PI- W02	38	35 66	113	45 16	4277 18	261 26
PI- W03	38	32 25	113	41 47	4269 67	265 43
PI- W04	38	32 63	113	46 27	4269 99	258 49
PI- W05	38	30 73	113	40 10	4247 22	266 80
PI- W06	38	24 02	113	42 11	4251 49	264 15
PI- W07	38	23 01	113	43 55	4251 68	261 90
PI- W08	38	21 31	113	43 87	4249 26	261 34
PI- W09	38	10 55	113	43 72	4229 64	260 96
FIELD CBR TESTS						
PI- F01	38	34 98	113	45 09	4274 07	254 51
PI- F02	38	32 94	113	43 38	4271 13	261 74
PI- F03	38	31 13	113	39 02	4266 51	266 94
PI- F04	38	30 41	113	39 09	4253 67	269 32
PI- F05	38	29 79	113	39 79	4253 49	268 34
PI- F06	38	33 40	113	39 10	4271 63	266 96
PI- F07	38	33 99	113	40 14	4271 94	267 61
PI- F08	38	30 49	113	43 93	4265 31	261 76
PI- F09	38	30 03	113	46 69	4264 91	257 73
PI- F10	38	28 51	113	41 87	4261 87	266 11
PI- F11	38	26 64	113	42 71	4253 43	263 33
PI- F12	38	22 11	113	45 16	4251 29	251 84
PI- F13	38	19 98	113	42 74	4244 14	262 92
PI- F14	38	9 07	113	44 20	4229 93	261 19
PI- F15	38	9 61	113	43 20	4229 66	261 69

GEOGRAPHIC COORDINATES OF ACTIVITIES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

TABLE II-1-1
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FUGRO NATIONAL, INC.

Station Number	Geol. Unit	Data (partly legible)
F16060	S1	
F16061	A/10	500 0 5 54 22 15 * GM [illegible] S2 S1 2 2 1 3 1 1 [illegible] 1 2 : 4 [illegible]
F16062	[illegible]	150 0 1 15 [illegible] [illegible] 10.0YR[illegible] [illegible]
F16063	12	
F16064	S2	
F16065	I4	
F16066	I2	
F16067	I2	
F16068	A/15	100 0 0 8 71 21 * GM 10.0YR6/4 [illegible] 2 2 1 3 1 3 [illegible] 1 4 : [illegible]
F16069	A/15	120 0 15 60 24 17 * GM 2 2 1 3 1 3 13 2 1 4 : [illegible] 4
F16070	A/08	85 0 15 45 37 16 GM [illegible] S1 [illegible] 4 : [illegible] 4
F16071	[illegible]	100 0 0 10 85 5 SM SM 10.0YR[illegible] 12 S2 [illegible]
F16072	[illegible]	[illegible] 0 10 [illegible] [illegible] 31 * GM 12 [illegible]
F16073	[illegible]	0 0 0 21 [illegible] * ML 10.0YR[illegible] [illegible] 1 1 : [illegible]
F16074	A/15	20 0 0 5 90 5 SP SM 10.0YR[illegible] 12 S2 [illegible] 2 1 1 :
F16075	A/15	100 0 3 7 68 25 SM 10.0YR5/4 12 [illegible] 2 1 4 : 20 [illegible] 2
F16076	A/15	18 0 0 2 93 5 SP SM 10.0YR[illegible] 12 [illegible] 2 1 3 :
F16077	A/15	25 0 0 3 81 16 * SM 10.0YR4/4 [illegible] 2 1 4 : 2.0 200.0 3 : 1
F16078	A/15	10 0 0 3 92 5 SP SM 10.0YR5/4 [illegible] 2 1 4 : 15.0 60.0 [illegible]
F16079	[illegible]	12 0 0 8 69 23 * SM 10.0YR5/4 [illegible] 2 1 1 : 0.0 0.0 2 : 1
F16080	A/15	125 0 0 5 91 4 SP 10.0YR[illegible] 12 [illegible] 2 1 4 : [illegible] 30.0 5
F16081	12	: 1
F16082	[illegible]	12 0 0 0 97 3 SP 10.0YR[illegible] [illegible] 2 1 1 : 8.0 30.0 3 : 0
F16083	S2	: 1
F16084	A/05	90 0 2 10 75 15 SM 10.0YR[illegible] 14 S1 [illegible] 2 2 4 : 4.0 [illegible] 3 : 0
F16085	A/15	25 0 0 0 54 46 * SM 10.0YR[illegible] S2 [illegible] 2 3 1 : 10.0 200.0 2 : 1
F16086	S1	: 1

EXPLANATION-PHYSICAL PROPERTIES

6=GRAIN SHAPE
7=MOISTURE CONTENT
8=PLASTICITY OF FINES
9=CONSISTENCY
10=STRUCTURE
11=CEMENTATION INDURATION
12=DEPTH TO CEMENTED LAYER (CM)
13=WEATHERING OF CLASTS
14=SOIL PROFILE DEVELOPMENT
15=CALICHE DEVELOPMENT
NOTE: ( ) OCCASIONAL (1-5%)
NOTE: * LAB DATA

GEOLOGIC STATION DATA
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE
II-1-2

FUGRO NATIONAL, INC.

Station No.

Described Geol. Unit

Date

Complete Geol. Unit

Observers

Field Photo Nos.

Air Photo No.

Sample (No=0, Yes=1)

SOIL PROPERTIES

1. Grain-Size Distribution: MPS (mm) - grain size of coarsest fraction; boulders and cobbles - percent of total; gravel, sand, and fines - percent less than 3 inches.

2. USCS Symbol

3. Descriptive Name (one adjective only)

4. Munsell Color (not applicable to gravel)

5. Lithology of gravel, cobbles, boulders: give rock type (I1, I2, M, etc.) in order of abundance.

6. Grain Shape (coarse grained soil only): 1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well-rounded.

7. Moisture Content: 1) Dry, 2) Slightly moist, 3) Moist, 4) Very moist, 5) Wet

8. Plasticity of Fines: 1) None, 2) Low, 3) Medium, 4) High

9. Consistency:
   Coarse-grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense
   Fine-grained: 6) Soft, 7) Firm, 8) Stiff, 9) Hard

10. Structure: 1) Non-stratified (homogeneous), 2) Stratified-tabular, 3) Stratified-other; if 3) describe

11. Cementation-Induration: 1) None, 2) Weak, 3) Moderate, 4) Strong

12. Depth to Cemented Layer (cm)

13. Weathering of boulders, cobbles, and gravel: 1) Fresh, 2) Slight, 3) Moderate, 4) Very

14. Degree of Soil Profile Development: 1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
    Describe

15. Degree of Caliche Development: 1) None, 2) Stage I, 3) Stage II, 4) Stage III, 5) Stage IV
    Describe

FIELD DATA SHEET
PINE VALLEY, UTAH

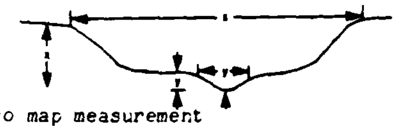
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-1-1
1 OF 2

FUGRO NATIONAL, INC.

TERRAIN

16. Average Drainage Depth (ft)



17. Average Drainage Width (ft)

18. Slope (percent) - field and/or topo map measurement

FIELD MAP

SURFACE FEATURES

19. Pit Depth (cm) ______________________

20. Thickness of Vesicular Silt (cm) ______________________

21. Desert Pavement Development
(None, Poor, Moderate, Well) ______________________

22. Patina Development
(None, Moderate, Well) ______________________

COMMENTS

____

____

____

____

ROCK DESCRIPTIONS

23. Rock Type/Formation ______________________

24. Color, Grain size, Hardness, Texture ______________________

____

25. Degree of Weathering ______________________

26. Structure
Bedding Characteristics ______________________

Bedding Attitude ______________________

Fracture, Joint ______________________

27. Secondary Alteration/Mineralization ______________________

____

FIELD DATA SHEET
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-1-1
2 OF 2

FUGRO NATIONAL, INC.

2.0 GROUND-WATER DATA

Explanation: Existing ground-water data in Pine Valley were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown in Table II-2-1. Locations of water wells and boreholes in which water-level measurements were available are shown in Drawing II-1-1. Well numbers listed in the left hand column of Table II-2-1 refer to well locations shown on Drawing II-1-1. Actual well numbers giving location, according to the Bureau of Land Management Land Survey System, are shown in the second column.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W-1	25-16-18bdd	5085 (1542)	340 (104)	300 (91)	1955	4785 (1458)	1
W-2	25-17-33dab	5263 (1604)	649 (198)	467 (142)	3 - 34	4797 (1462)	1
W-3	26-16-19bbd	5205 (1586)	394 (120)	340 (104)	11 -79	4865 (1483)	2
W-4	26-17-17dac	5355 (1632)	801 (244)	717 (219)	1955	4638 (1414)	1
W-5	28-17-29caa	6245 (1903)	140 (43)	50 (15)	12 - 72	6195 (1888)	4
W-6	28-17-1caa	5680 (1731)	510 (155)	dry	1 - 80	—	4
W-7	28-17-11cca	5680 (1731)	1305 (398)	365 (111)	1 - 80	5315 (1620)	1, 4
W-8	28-17-22dda	5765 (1757)	2005 (611)	375 (114)	1 - 80	5315 (1620)	4
W-9	30-17-27aaa	6550 (1996)	648 (198)	dry	1936	< 5902	1
WR-T-4	26-17-10aab-1	5300 (1615)	951 (290)	443 (135)	7 - 80	4857 (1481)	3
WR-O-4	26-17-10aab-2	5300 (1615)	1157 (353)	439 (134)	7 - 80	4861 (1482)	3

* SALT LAKE BASELINE AND MERIDIAN; ALL TOWNSHIPS SOUTH, ALL RANGES WEST

** 1. STEPHENS, 1976
2. FUGRO WATER RESOURCES STUDY, FY79 AND FY80
3. FUGRO INTERMEDIATE AQUIFER DRILLING PROGRAM, 1980
4. STATE OF UTAH, ENGINEER'S OFFICE, DRILLER'S LOGS

GROUND-WATER DATA
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

TABLE II-2-1

FUGRO NATIONAL, INC.

3.0 SEISMIC REFRACTION DATA

Explanation: Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction along the geophone array from geophone 1 to geophone 24.

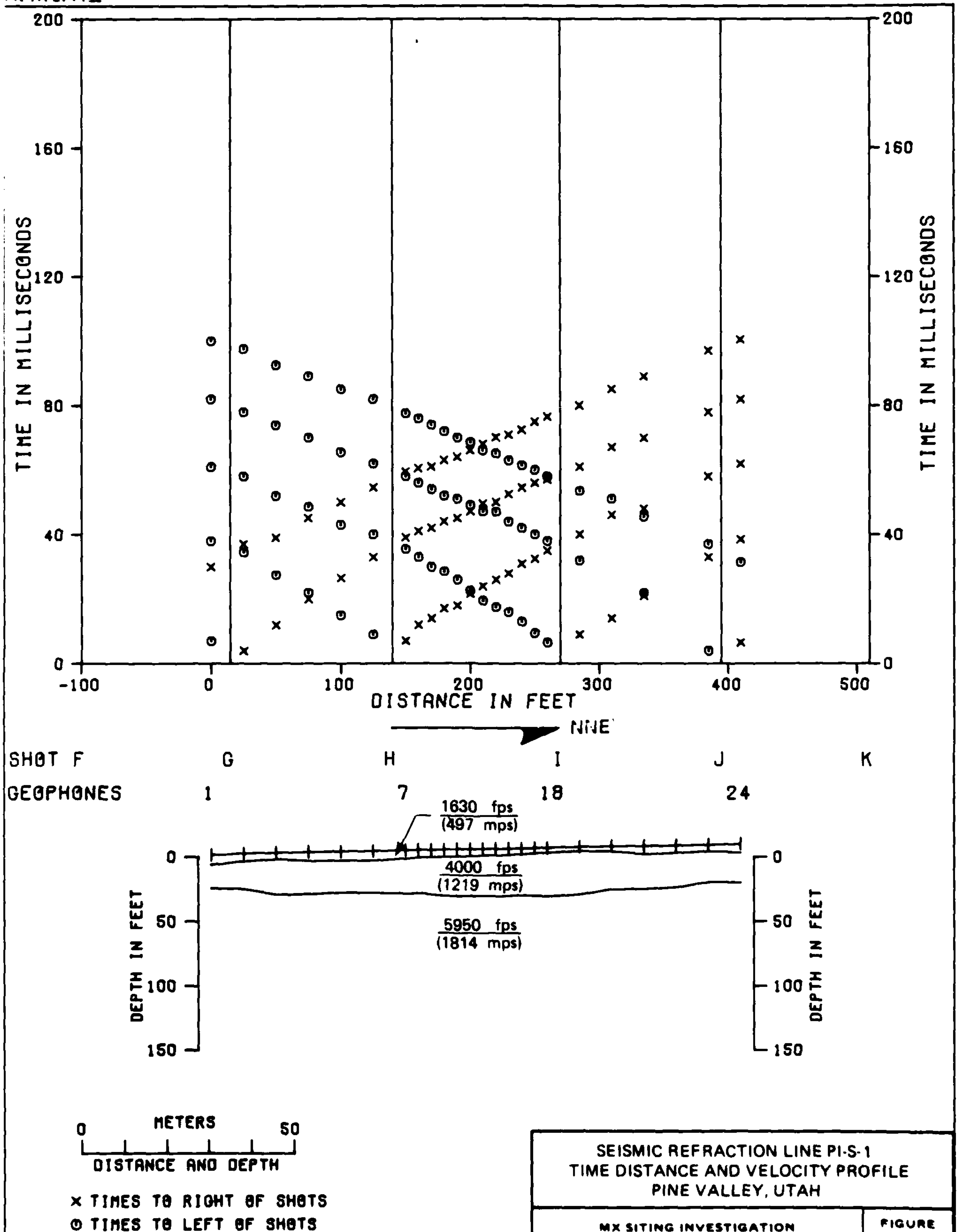
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊙, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave

velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.

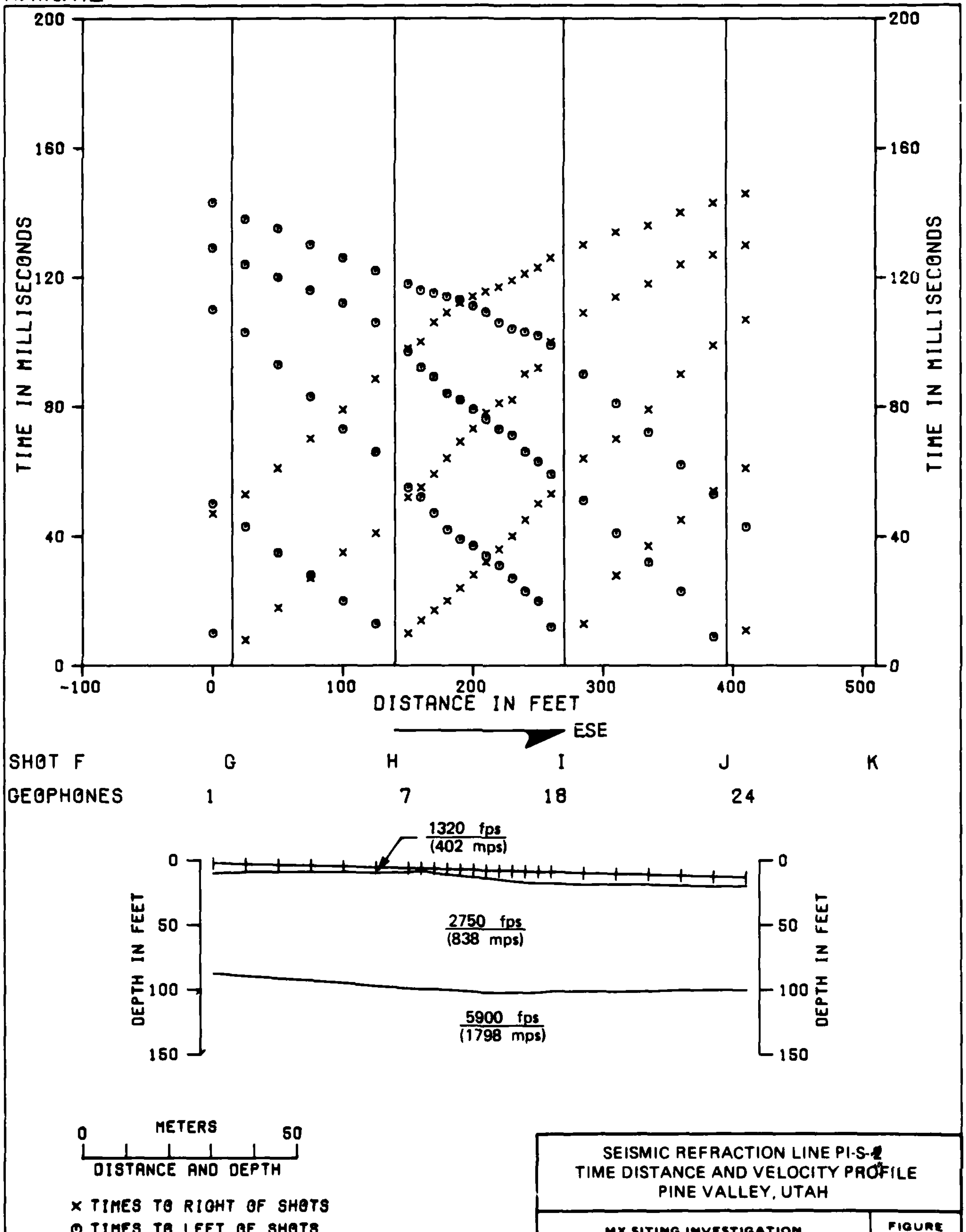


SEISMIC REFRACTION LINE PI-S-1
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-1

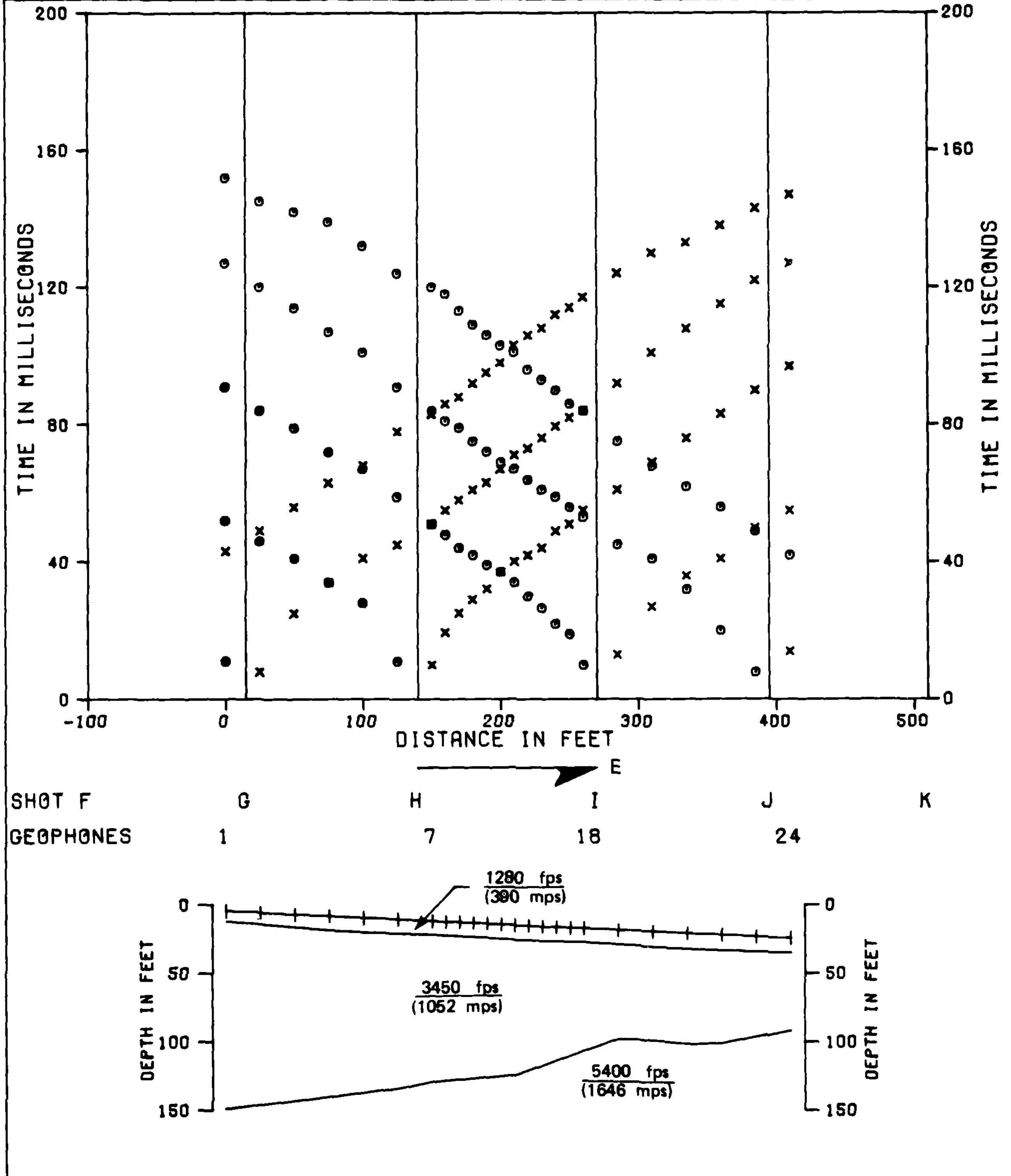
FUGRO NATIONAL, INC.

FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-S-2 TIME DISTANCE AND VELOCITY PROFILE PINE VALLEY, UTAH	
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-2

FUGRO NATIONAL, INC.



0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

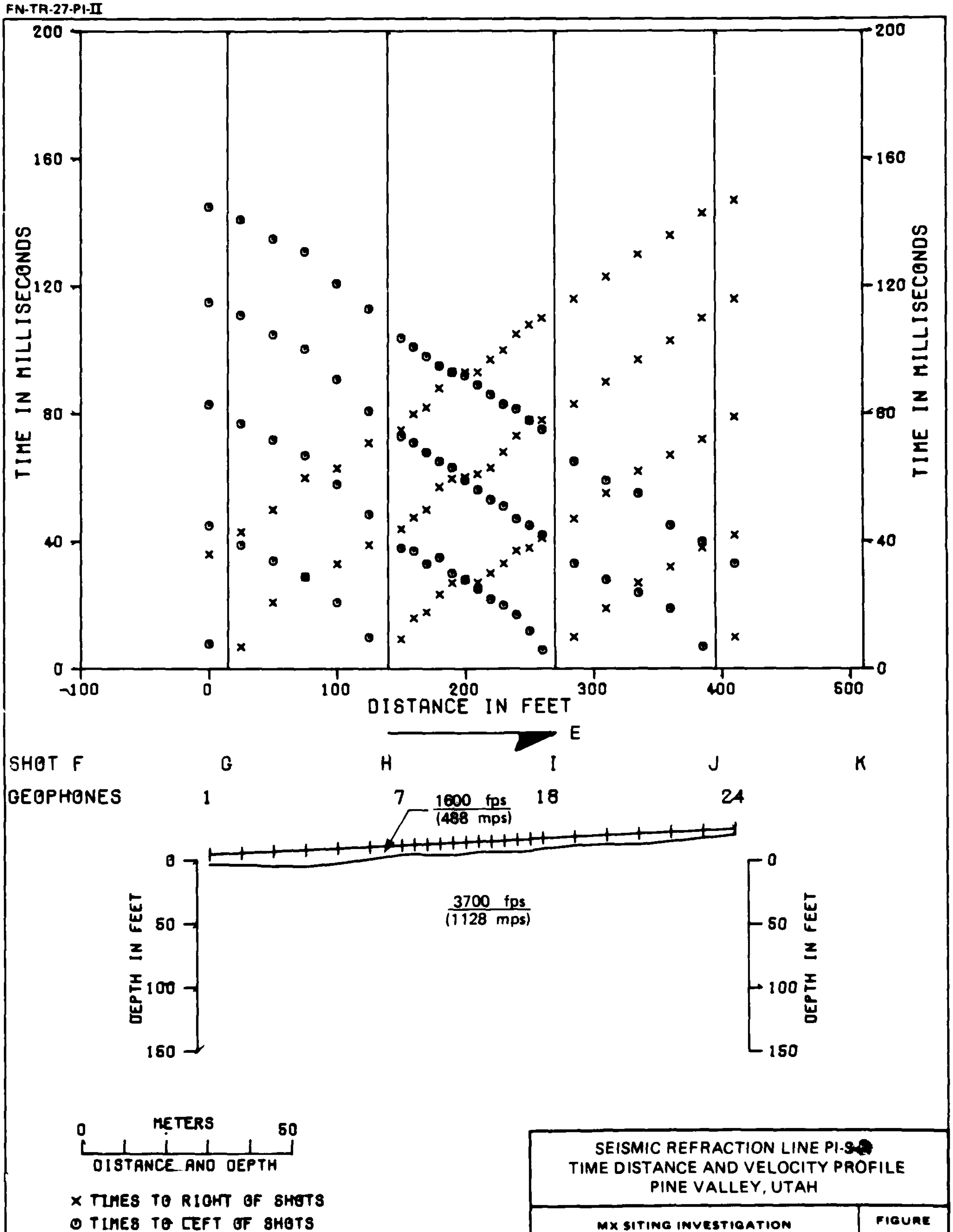
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-[illegible]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-3

FUGRO NATIONAL, INC.

FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-3
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-4

FUGRO NATIONAL, INC.

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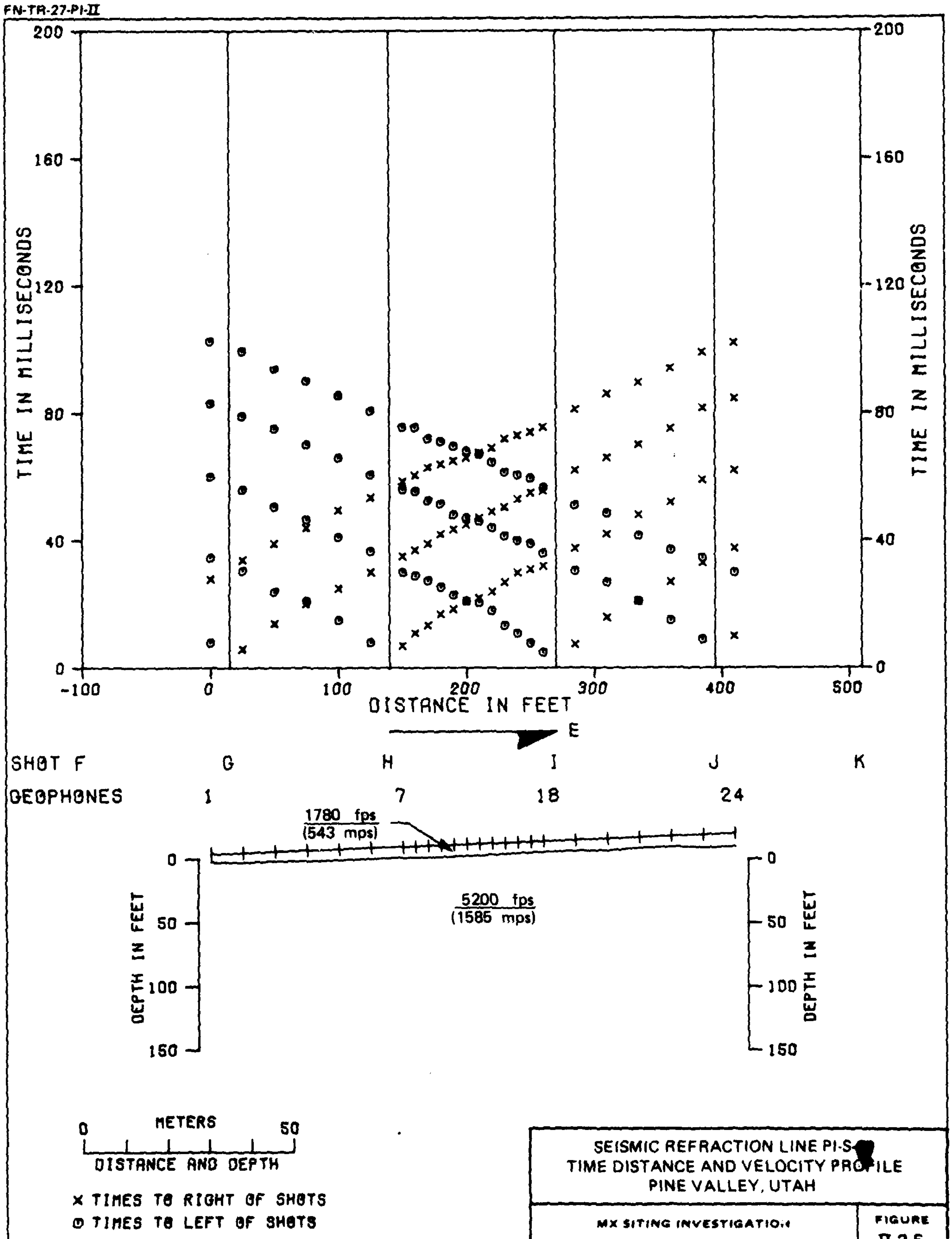
FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-S-?
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-5

FUGRO NATIONAL, INC.

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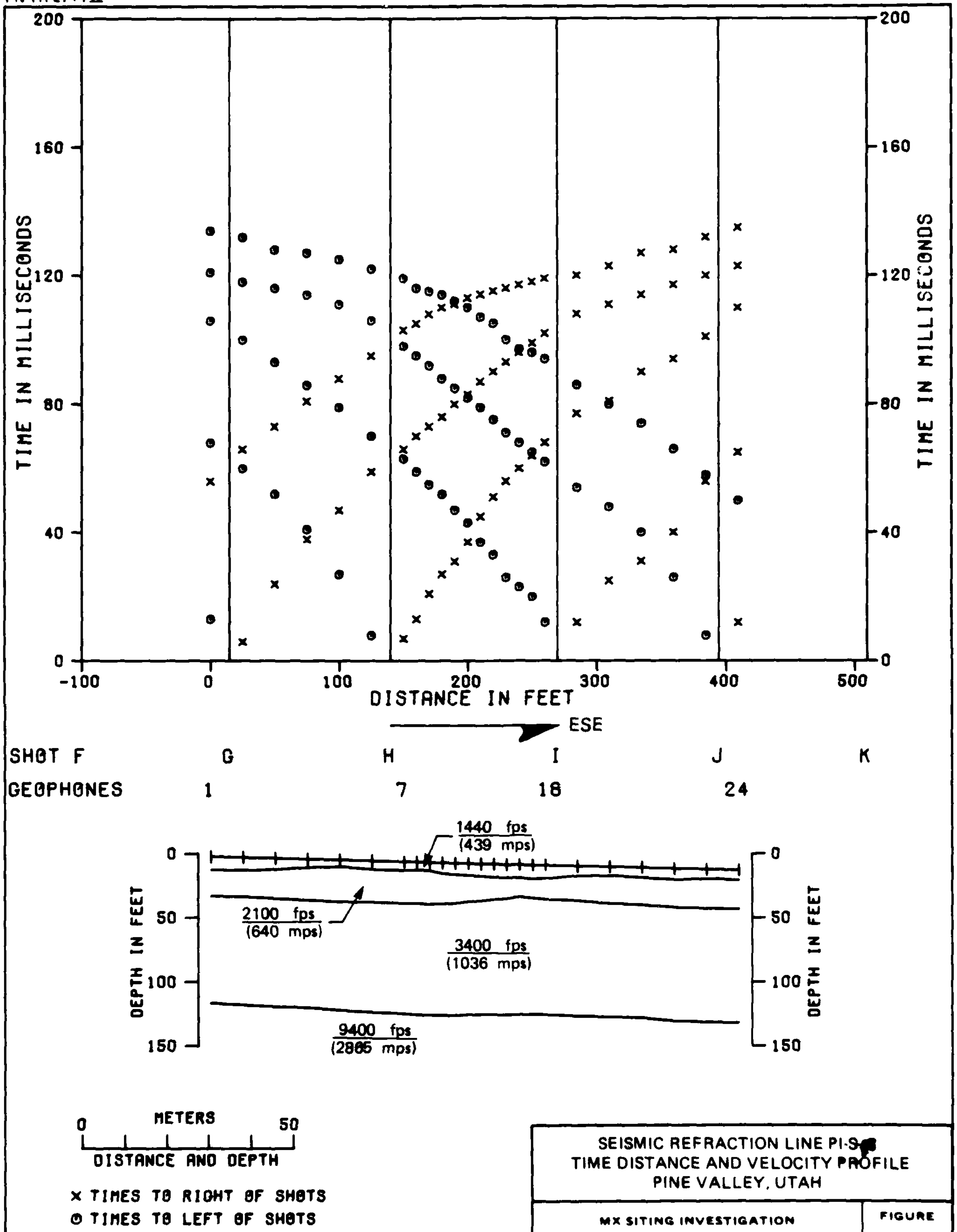
FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-S-6
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION

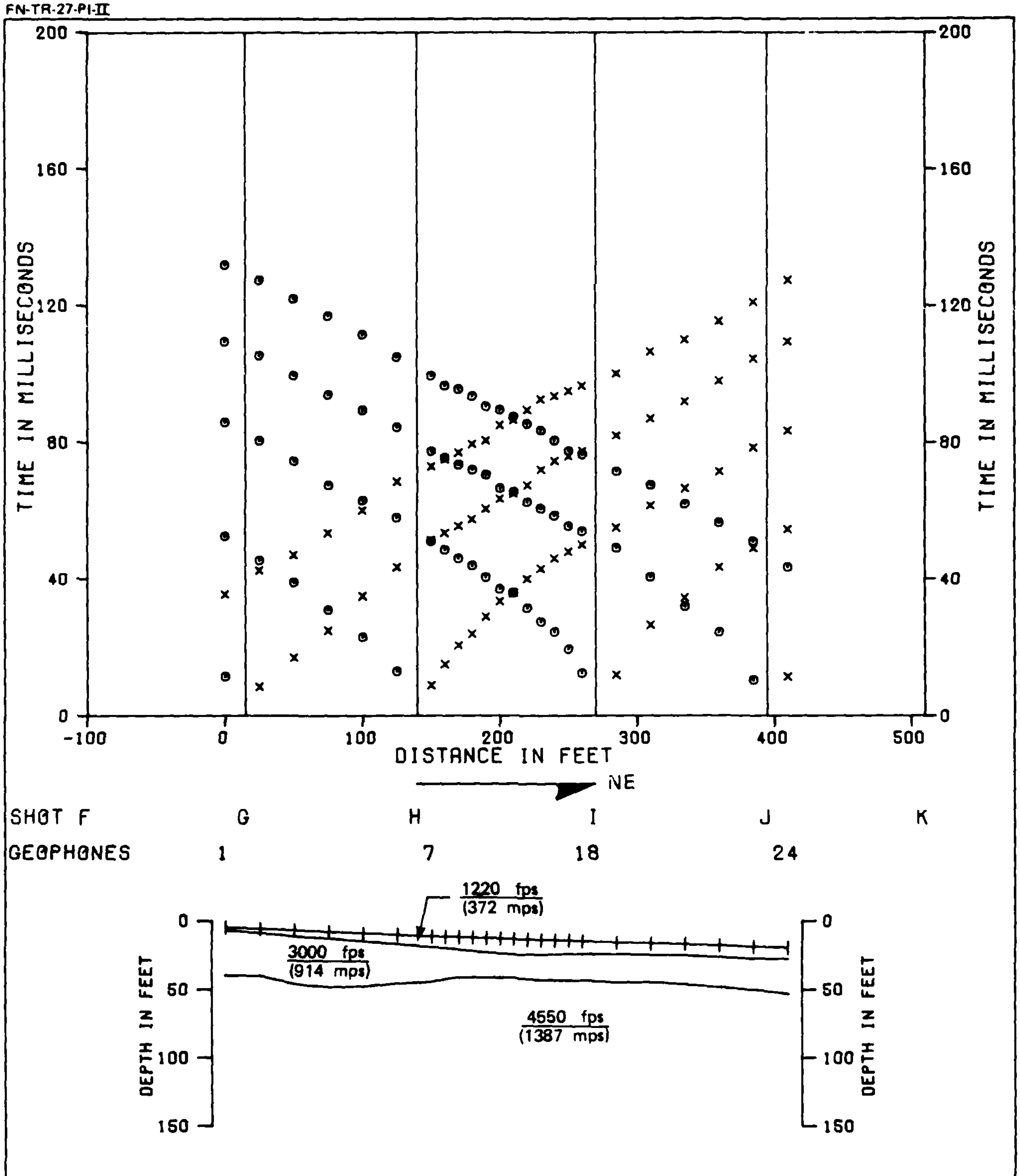
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-3-6

FUGRO NATIONAL, INC.

24 MAR 81

FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-S-7
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

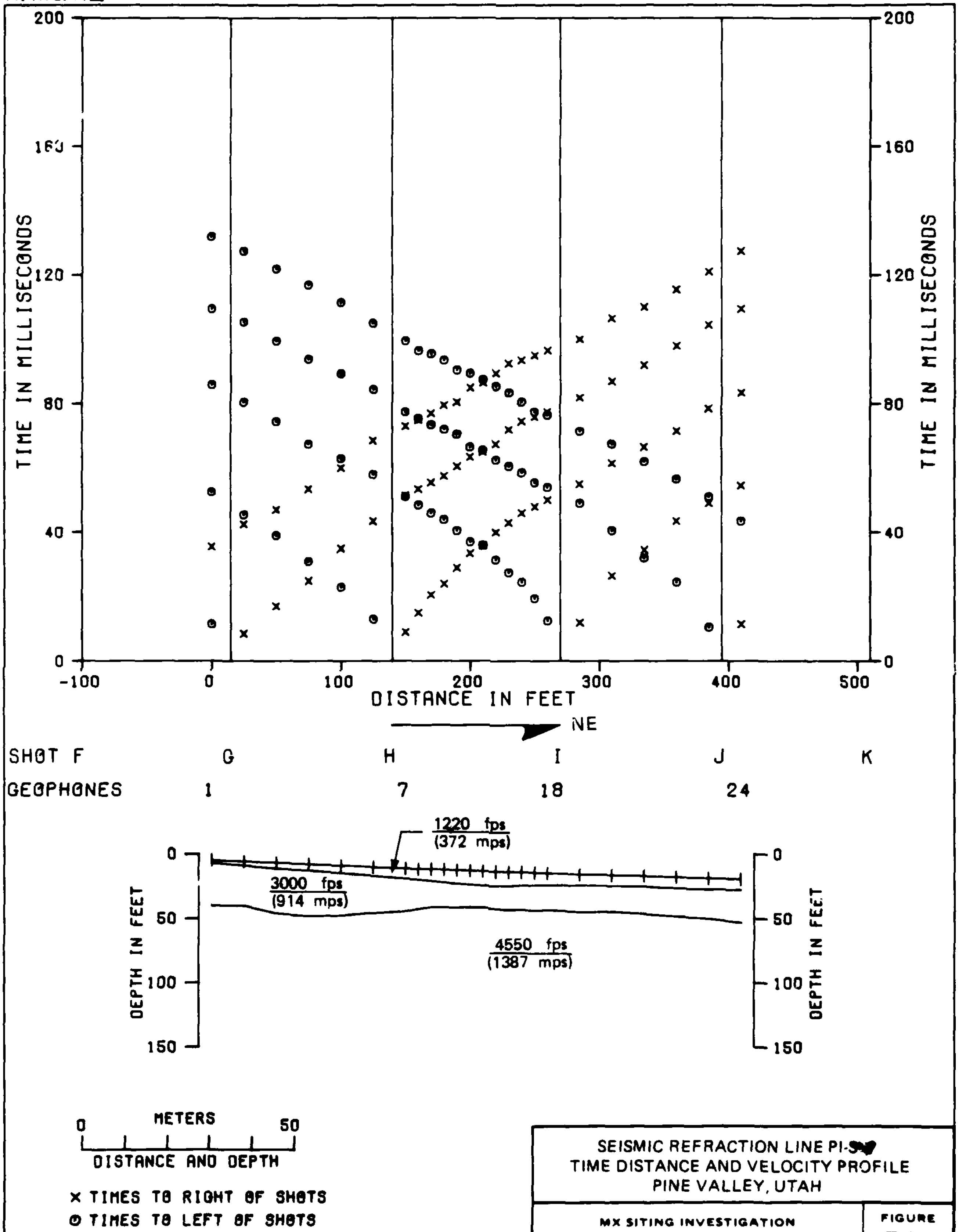
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-7

FUGRO NATIONAL, INC.

24 MAR 81

FN-TR-27-PI-II



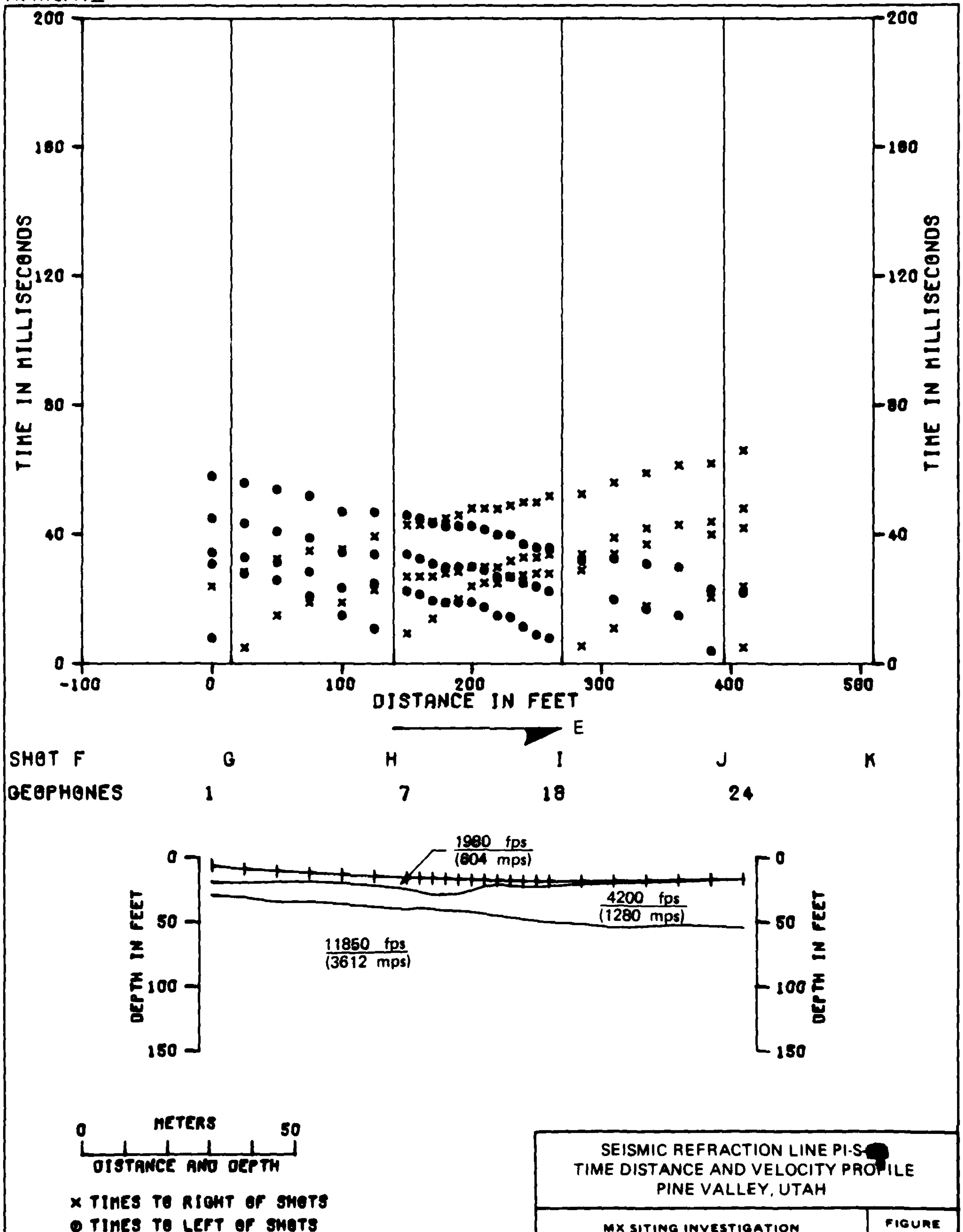
SEISMIC REFRACTION LINE PI-S[illegible]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-7

FUGRO NATIONAL, INC.

24 MAR 81



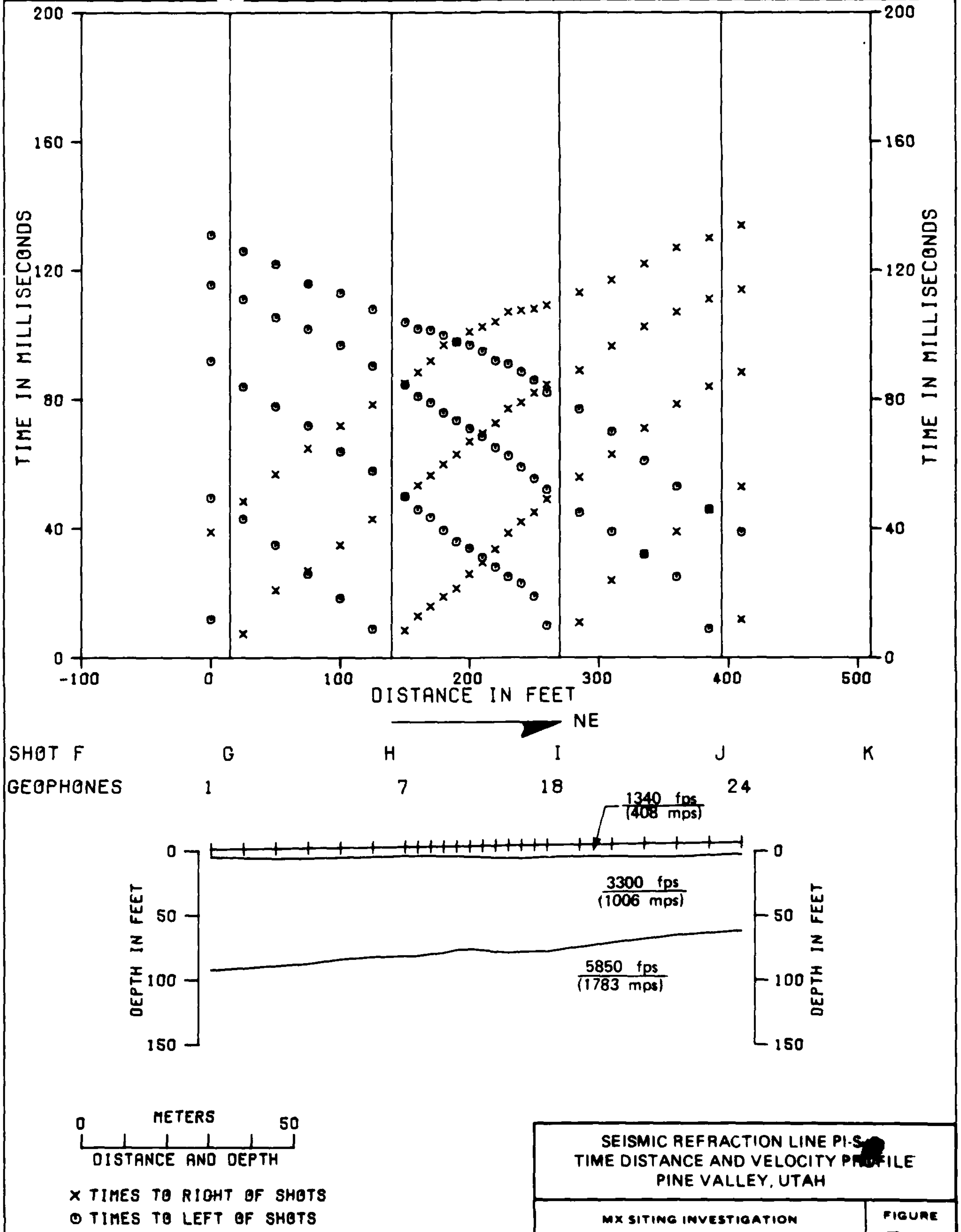
SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-3-8

FUGRO NATIONAL, INC.

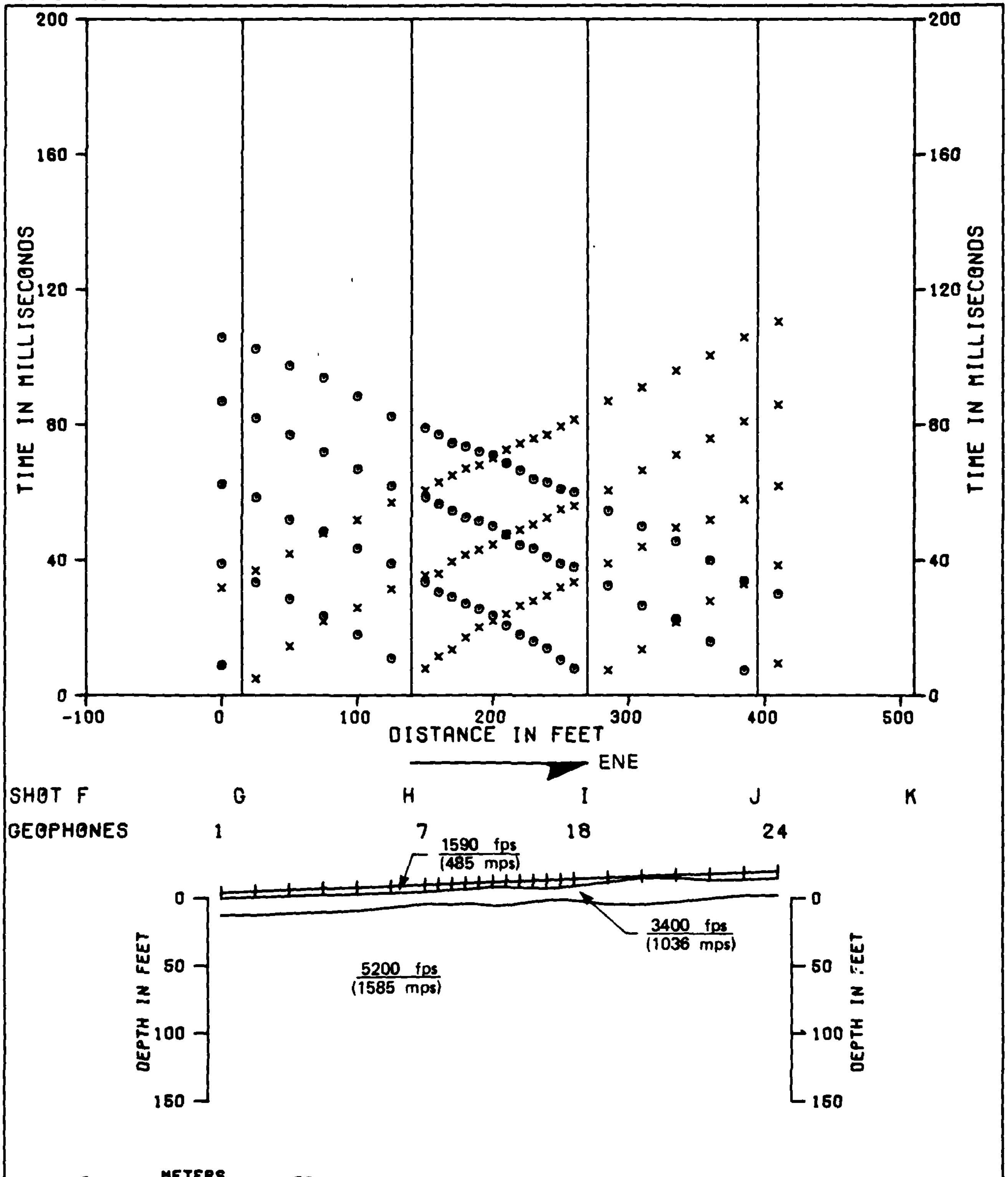


SEISMIC REFRACTION LINE PI-S
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-9

FUGRO NATIONAL, INC.



METERS
0 50
DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

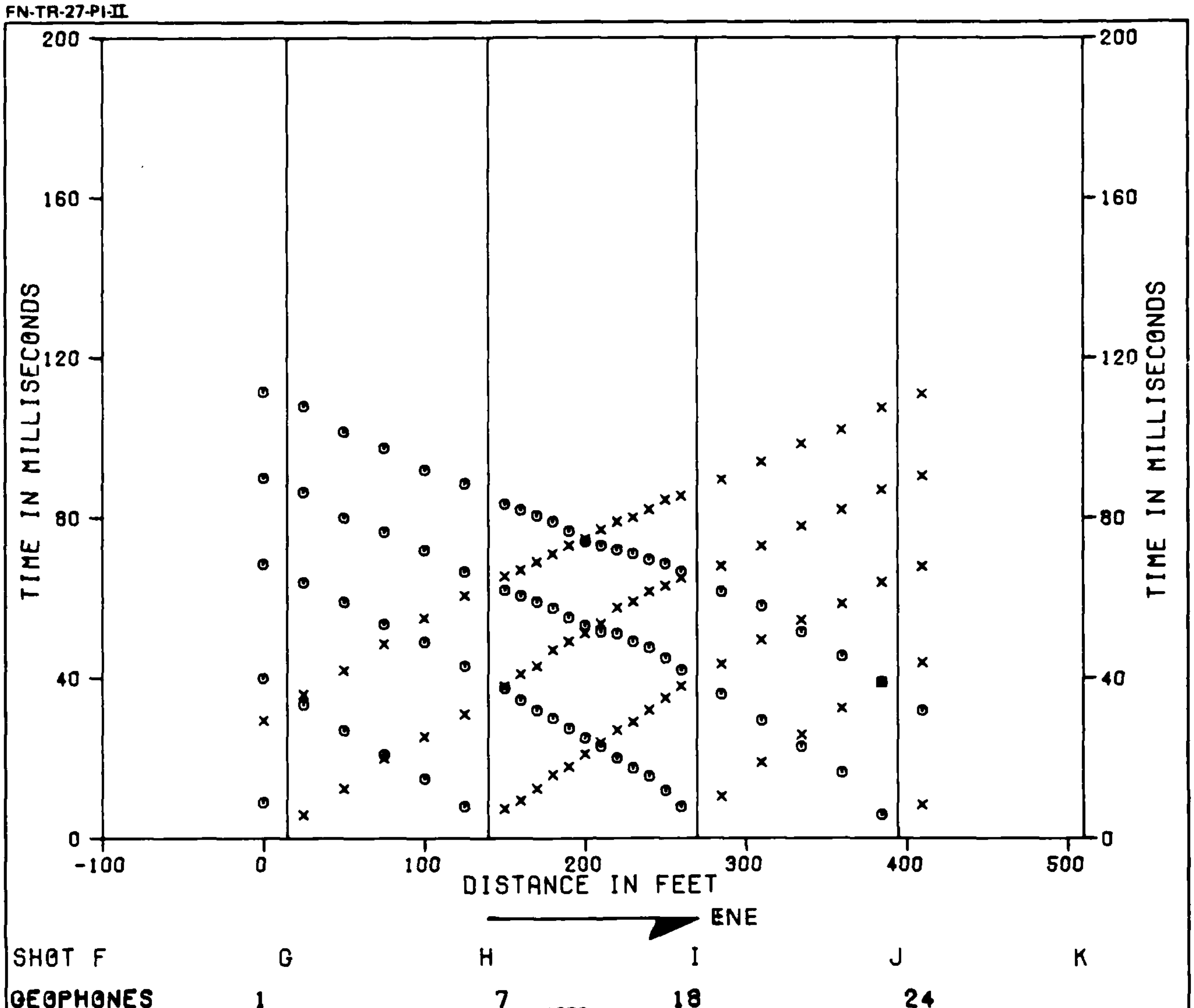
SEISMIC REFRACTION LINE PI-S-1
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

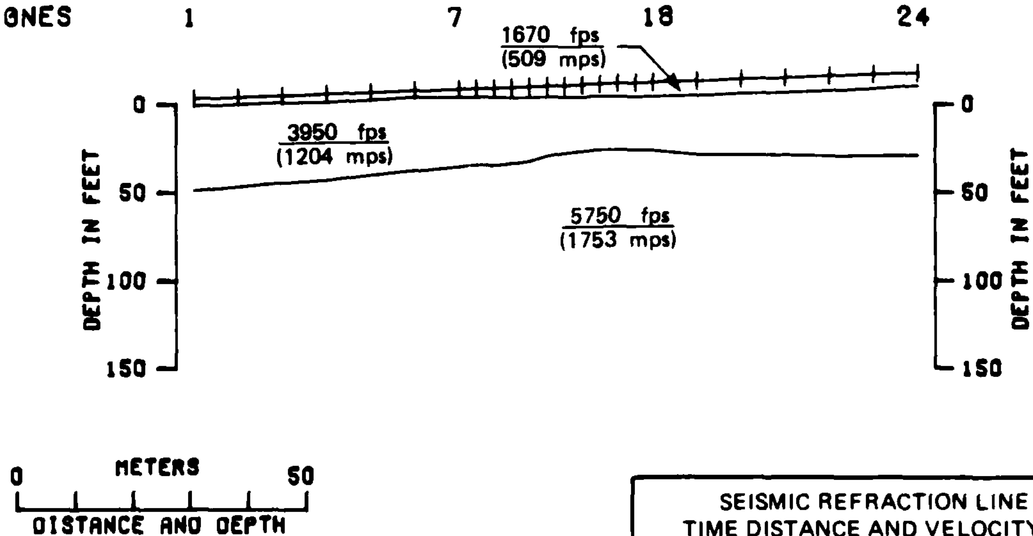
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-3-10

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

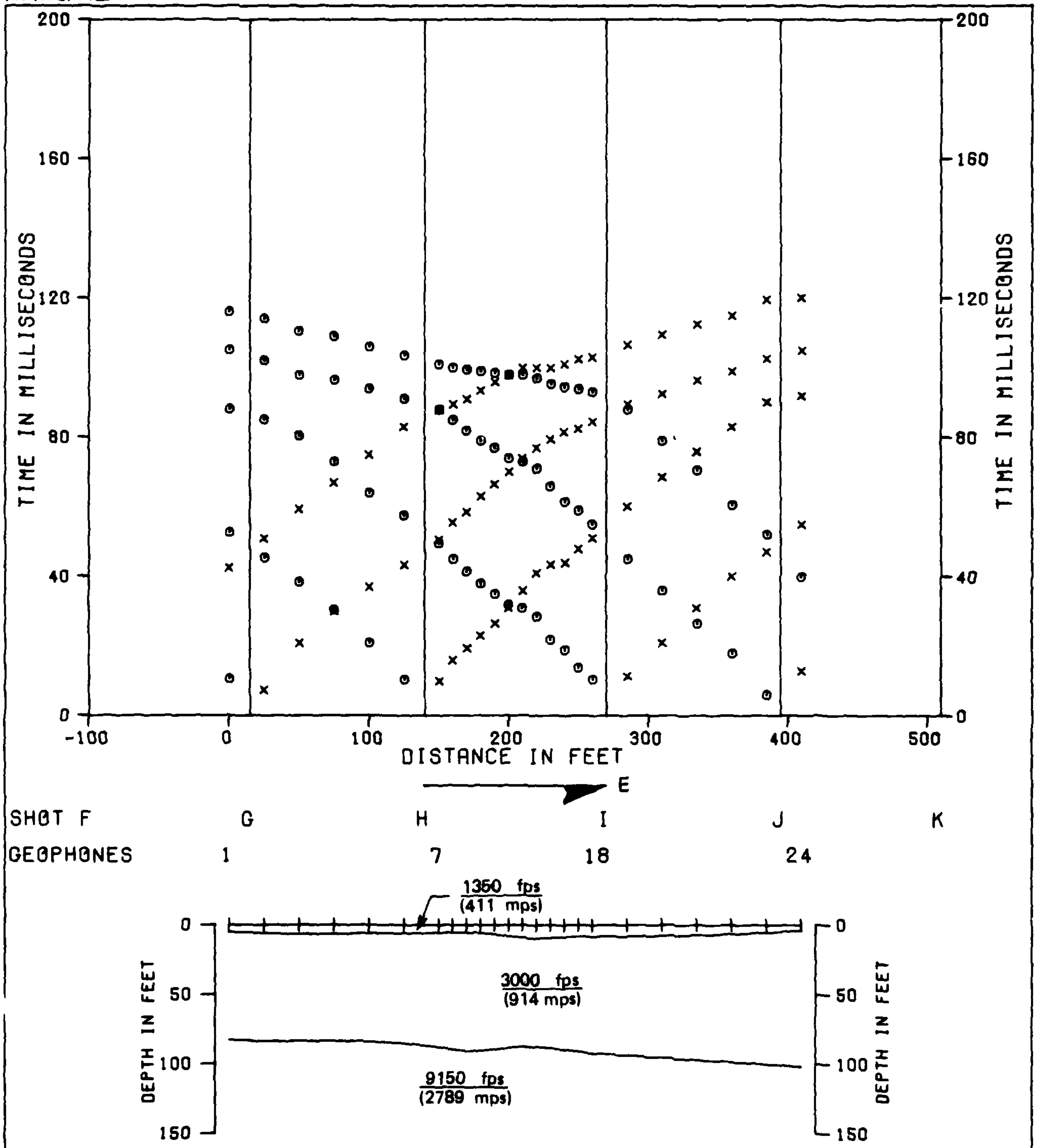




× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-[illegible] TIME DISTANCE AND VELOCITY PROFILE PINE VALLEY, UTAH	
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-11
FUGRO NATIONAL, INC.	

24 MAR 81



0 METERS 50

DISTANCE AND DEPTH

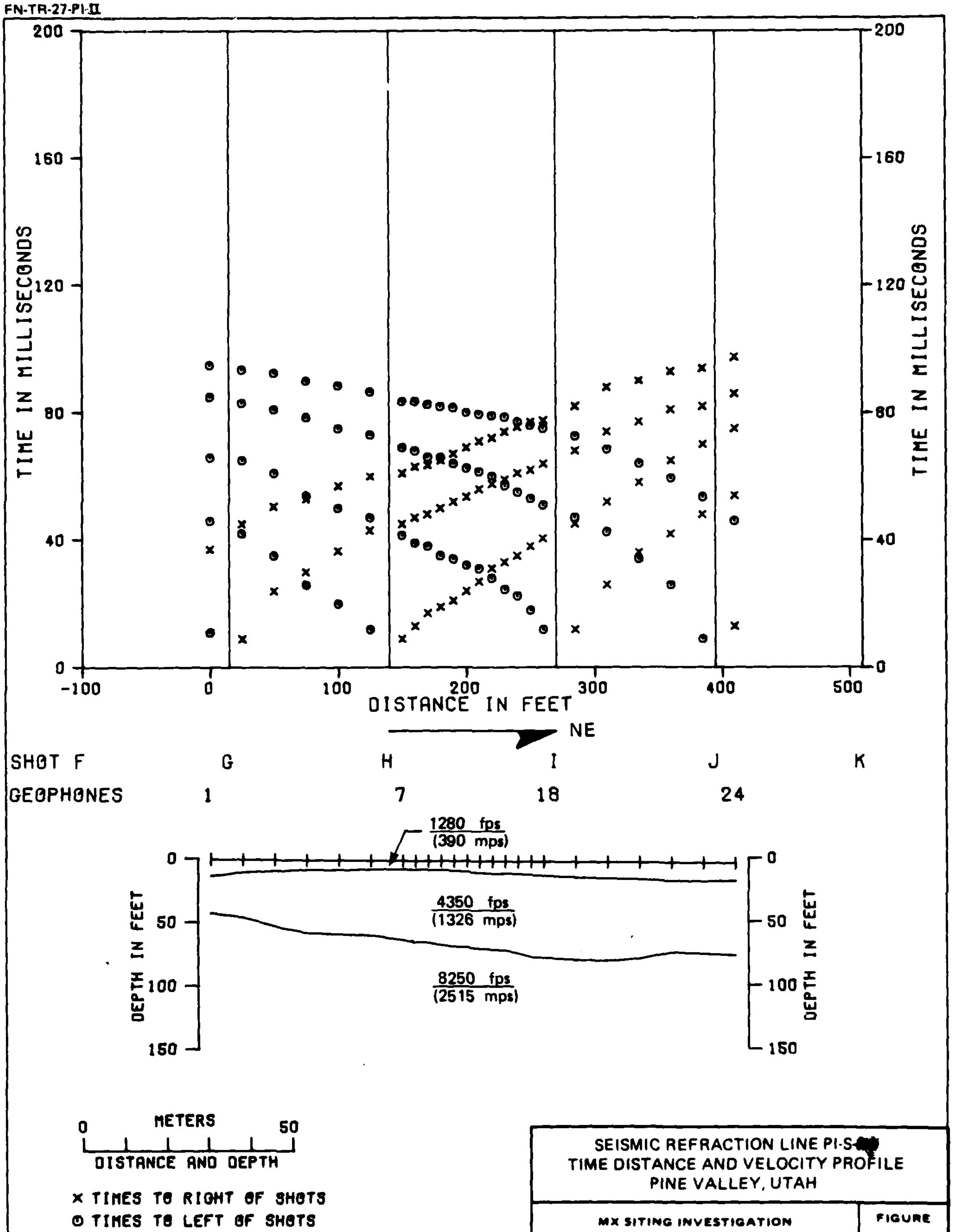
× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-12

FUGRO NATIONAL, INC.

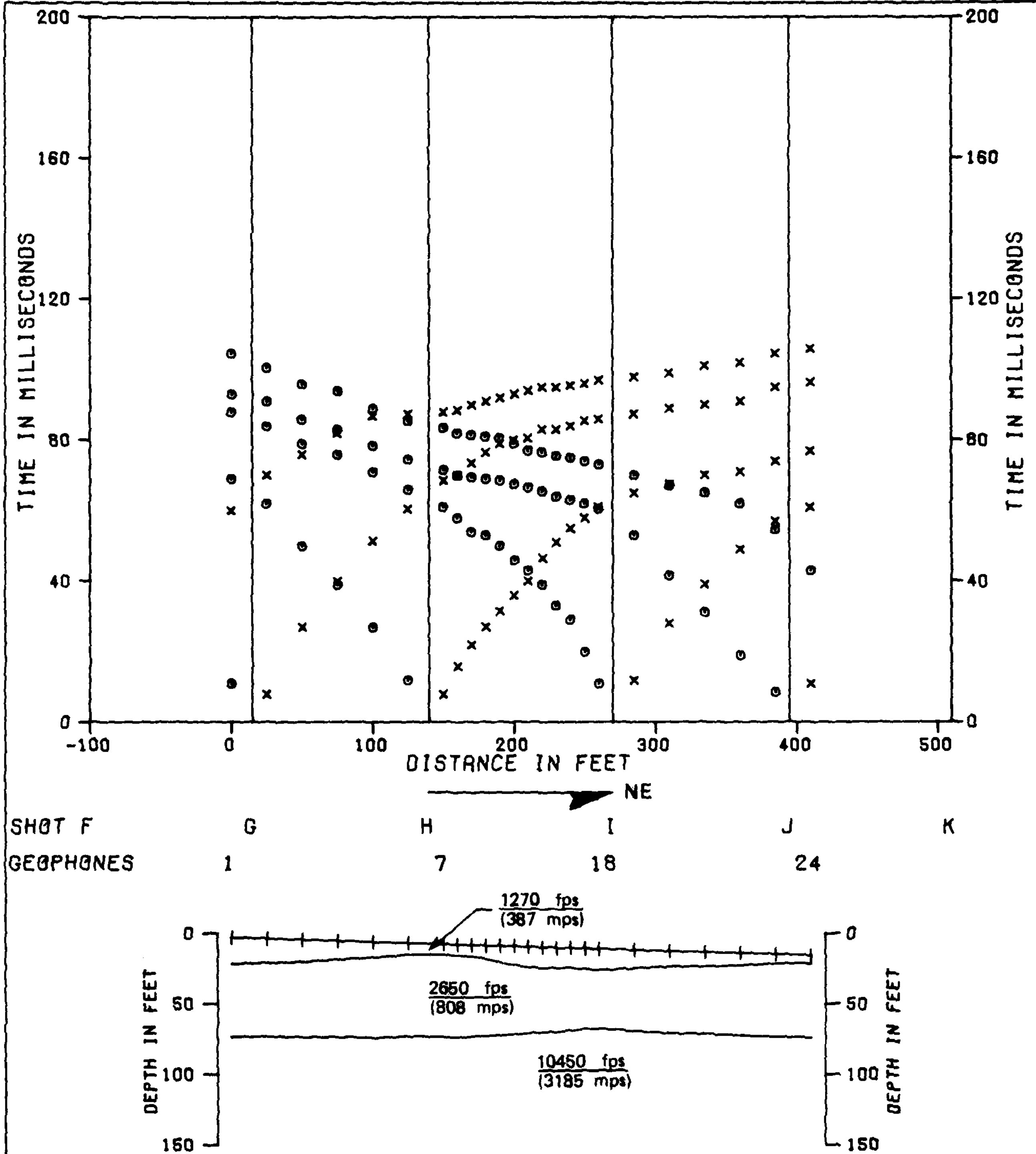


SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-13

FUGRO NATIONAL, INC.



0 METERS 50
DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-[illegible]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE
II-3-14

FUGRO NATIONAL, INC.

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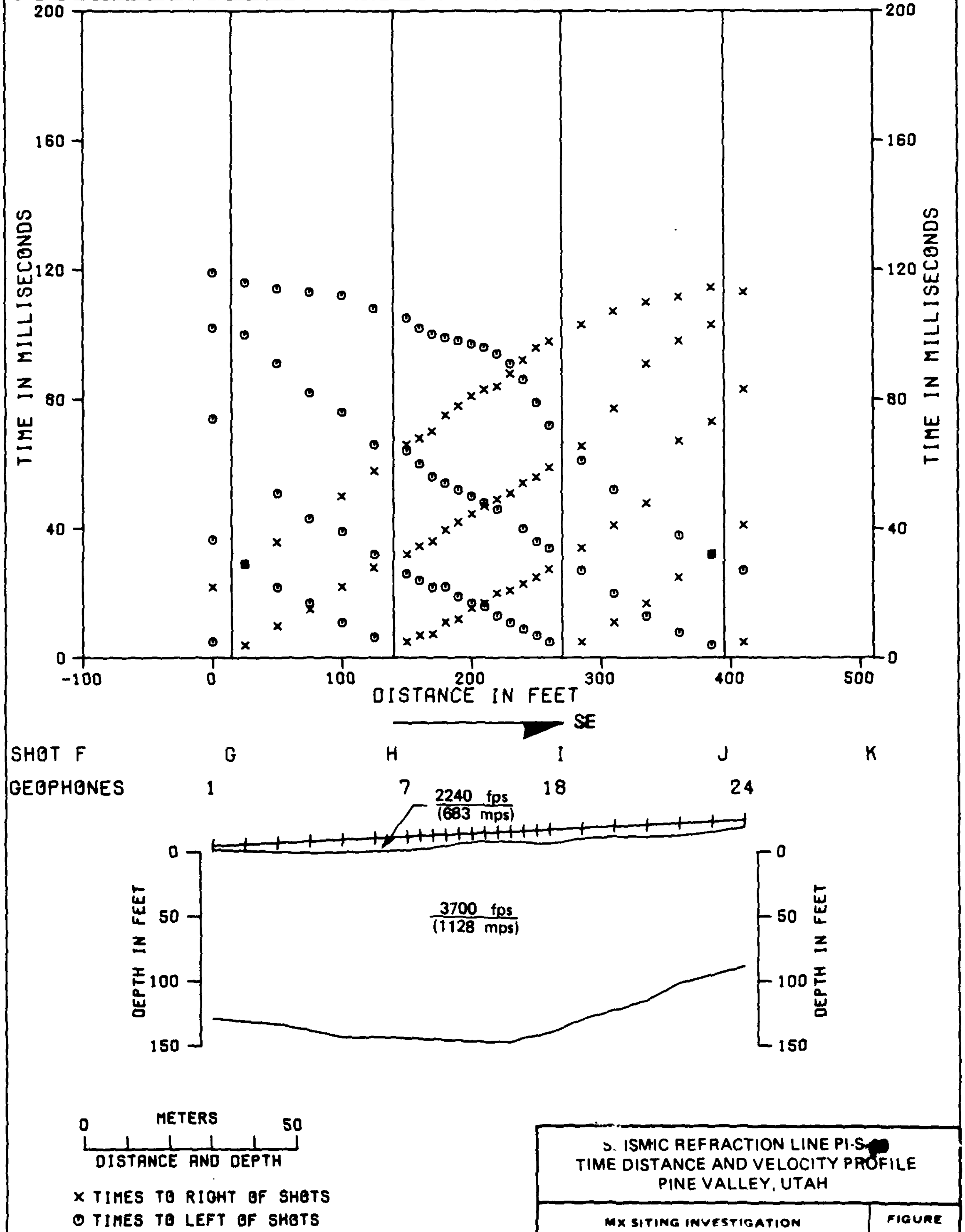
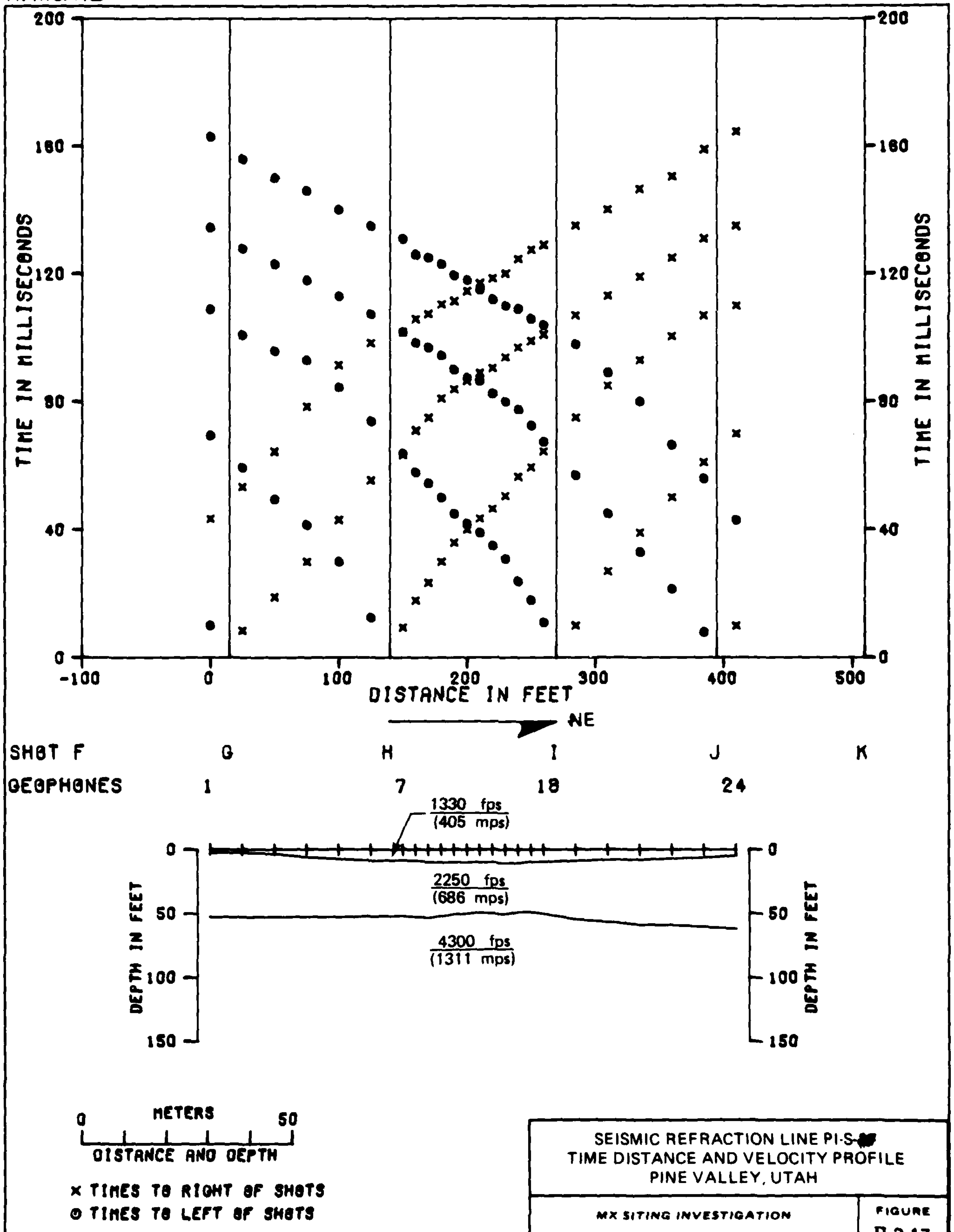


SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-16

FUGRO NATIONAL, INC.

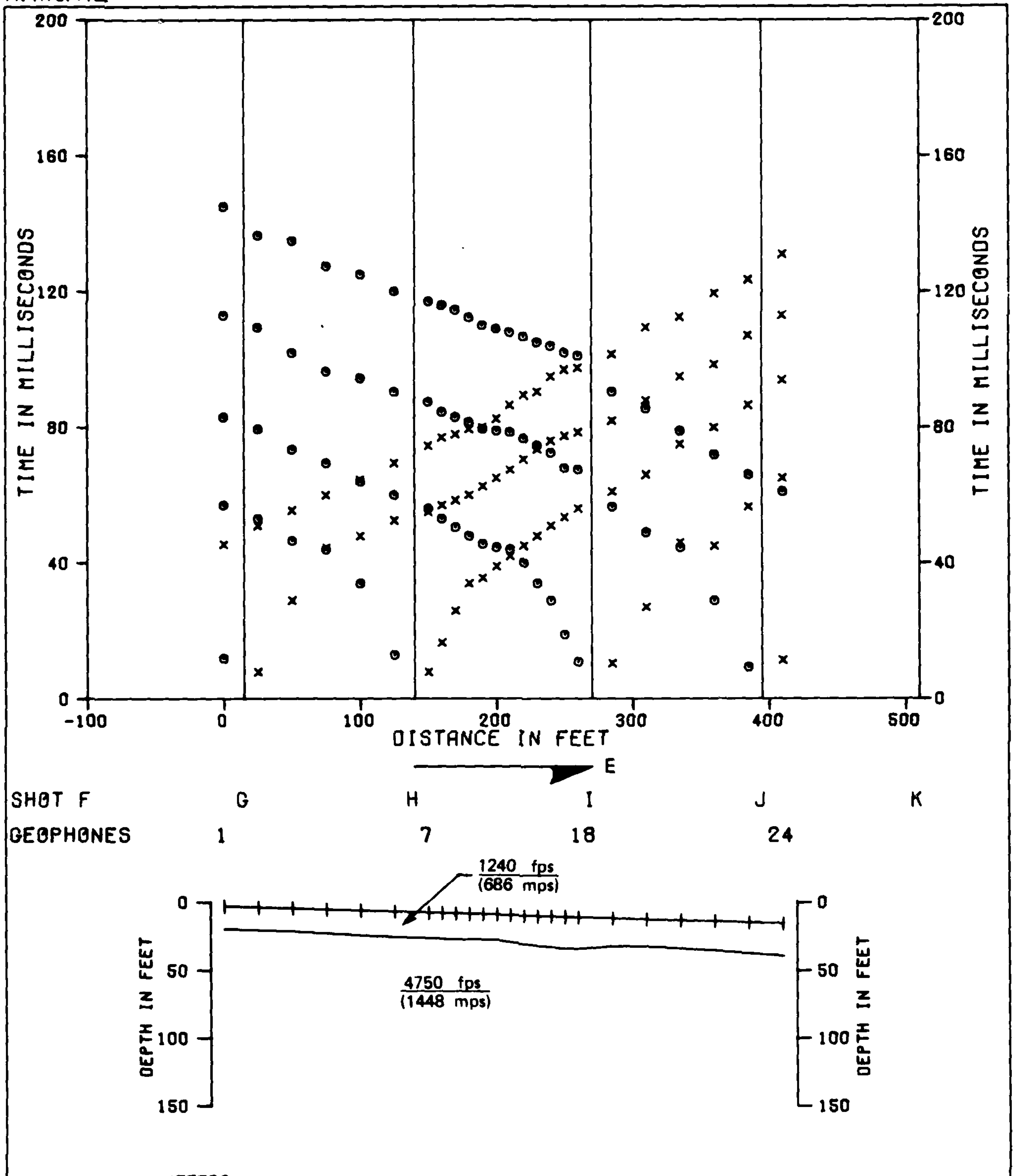


SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-17

FUGRO NATIONAL, INC.

FN-TR-27-PI-II



0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

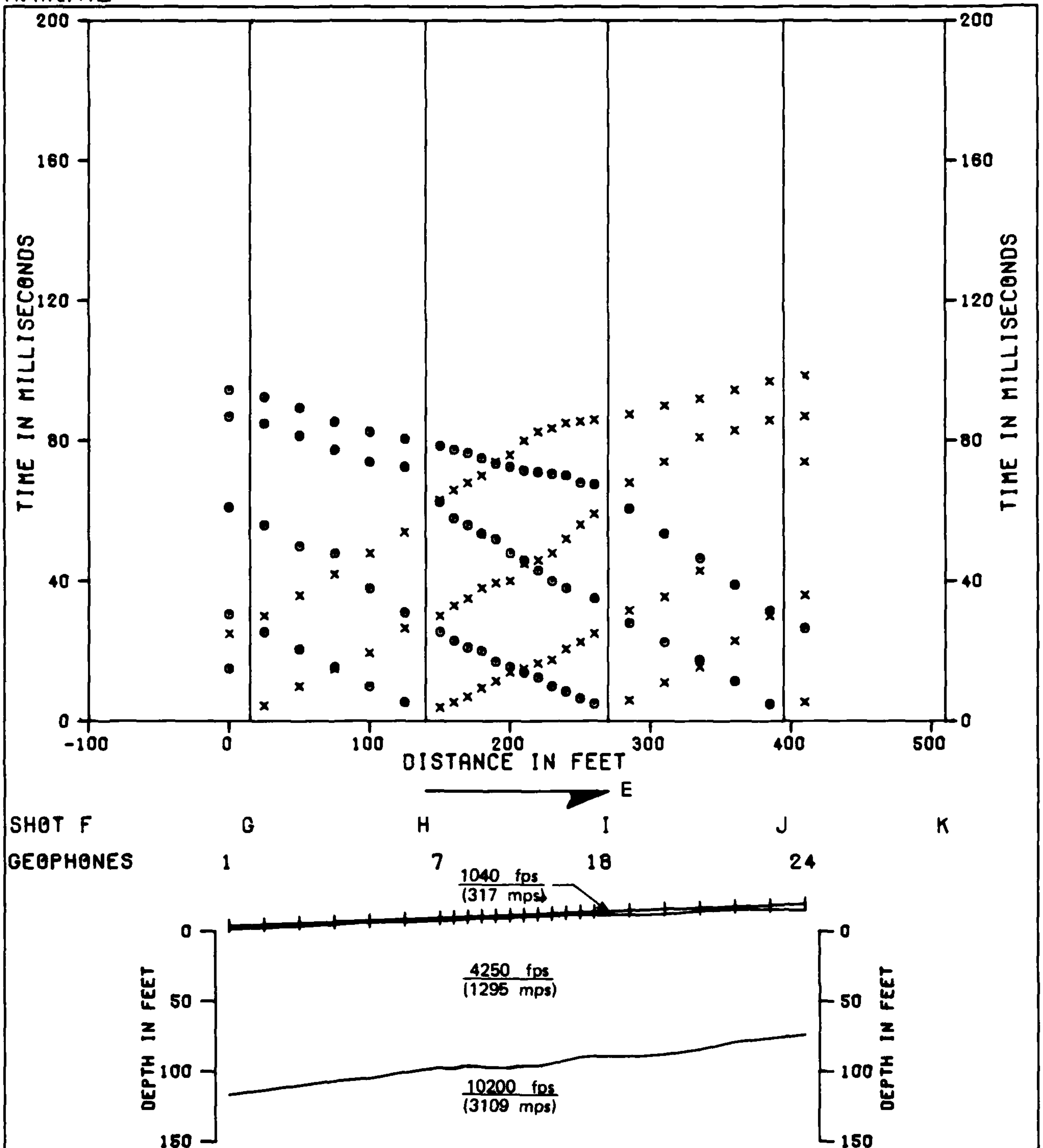
MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-3-18

FUGRO NATIONAL, INC.

24 MAR 81



0 METERS 50

DISTANCE AND DEPTH

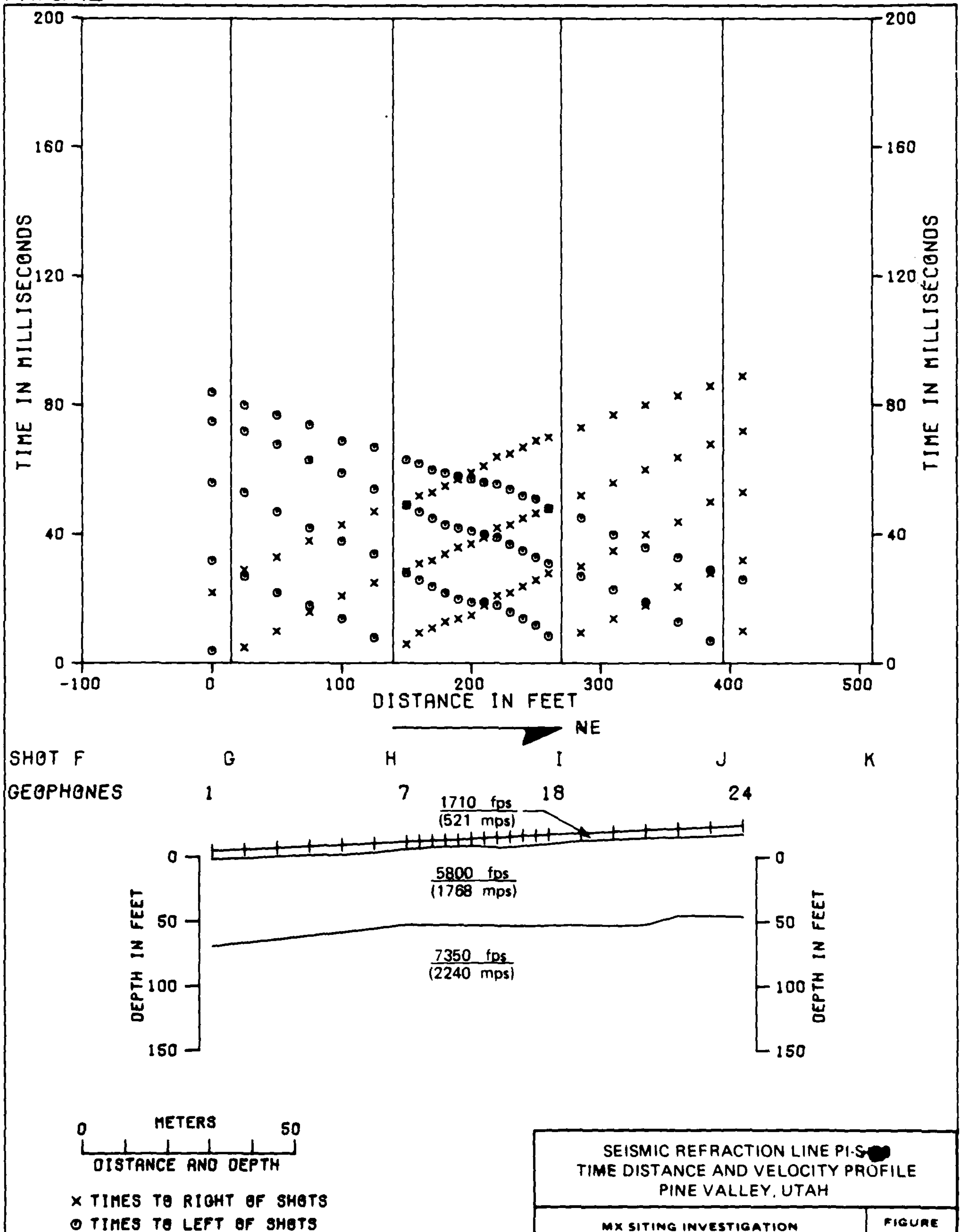
× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE PI-S-[redacted]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-19

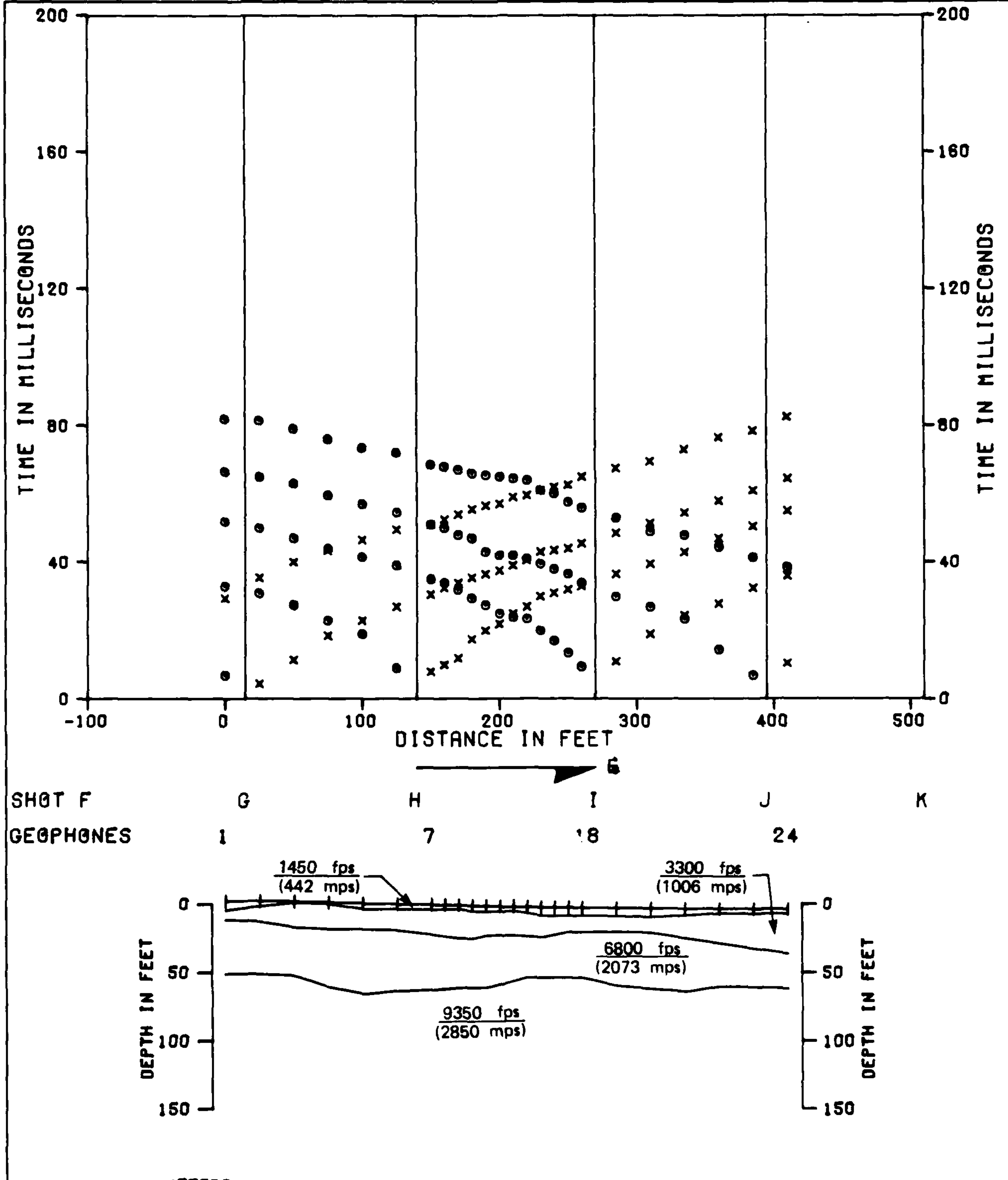
FUGRO NATIONAL, INC.



SEISMIC REFRACTION LINE PI-S[redacted]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE – BMO	FIGURE II-3-20

FUGRO NATIONAL, INC.



0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

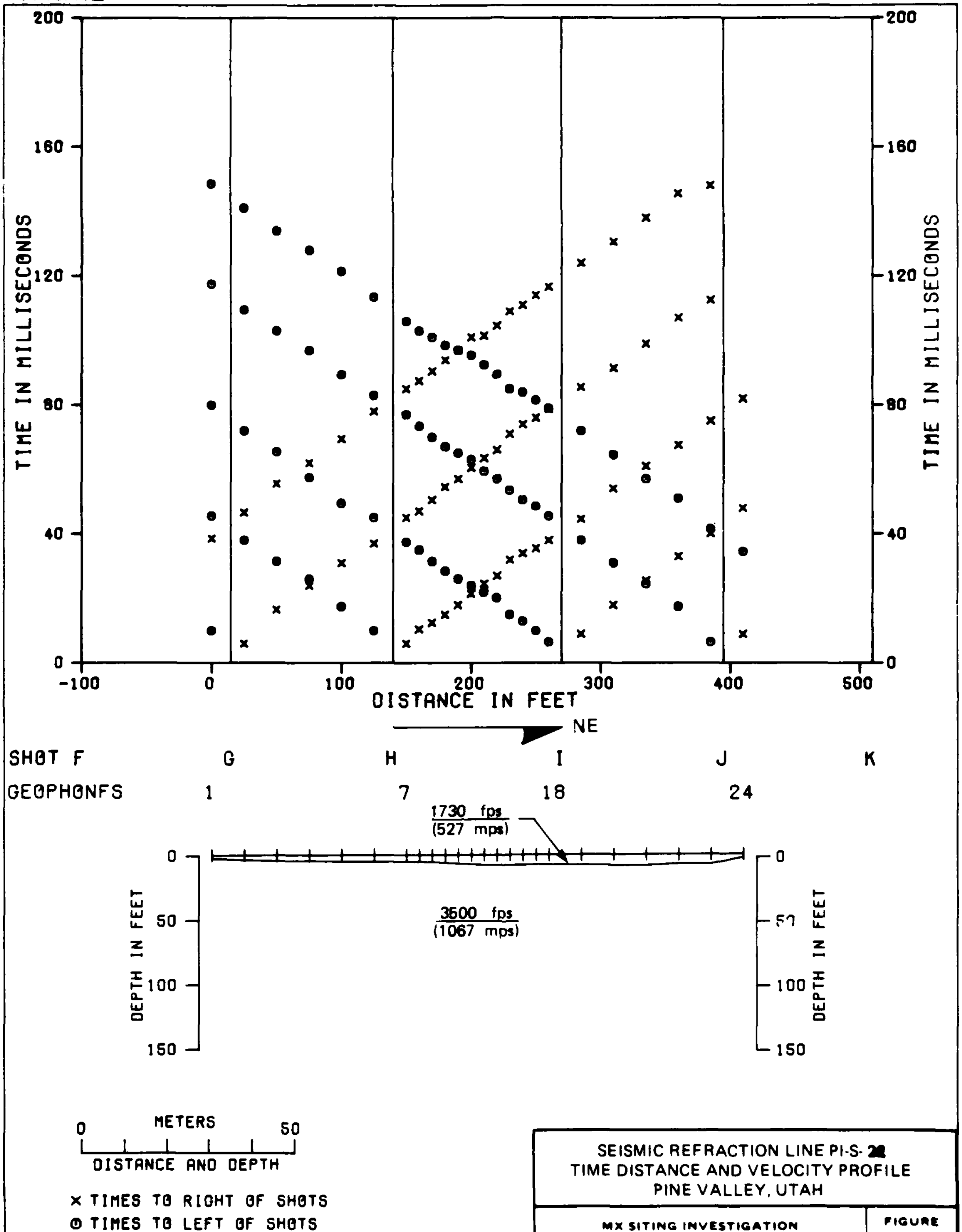
SEISMIC REFRACTION LINE PI-S-[illegible]
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-3-21

FUGRO NATIONAL, INC.

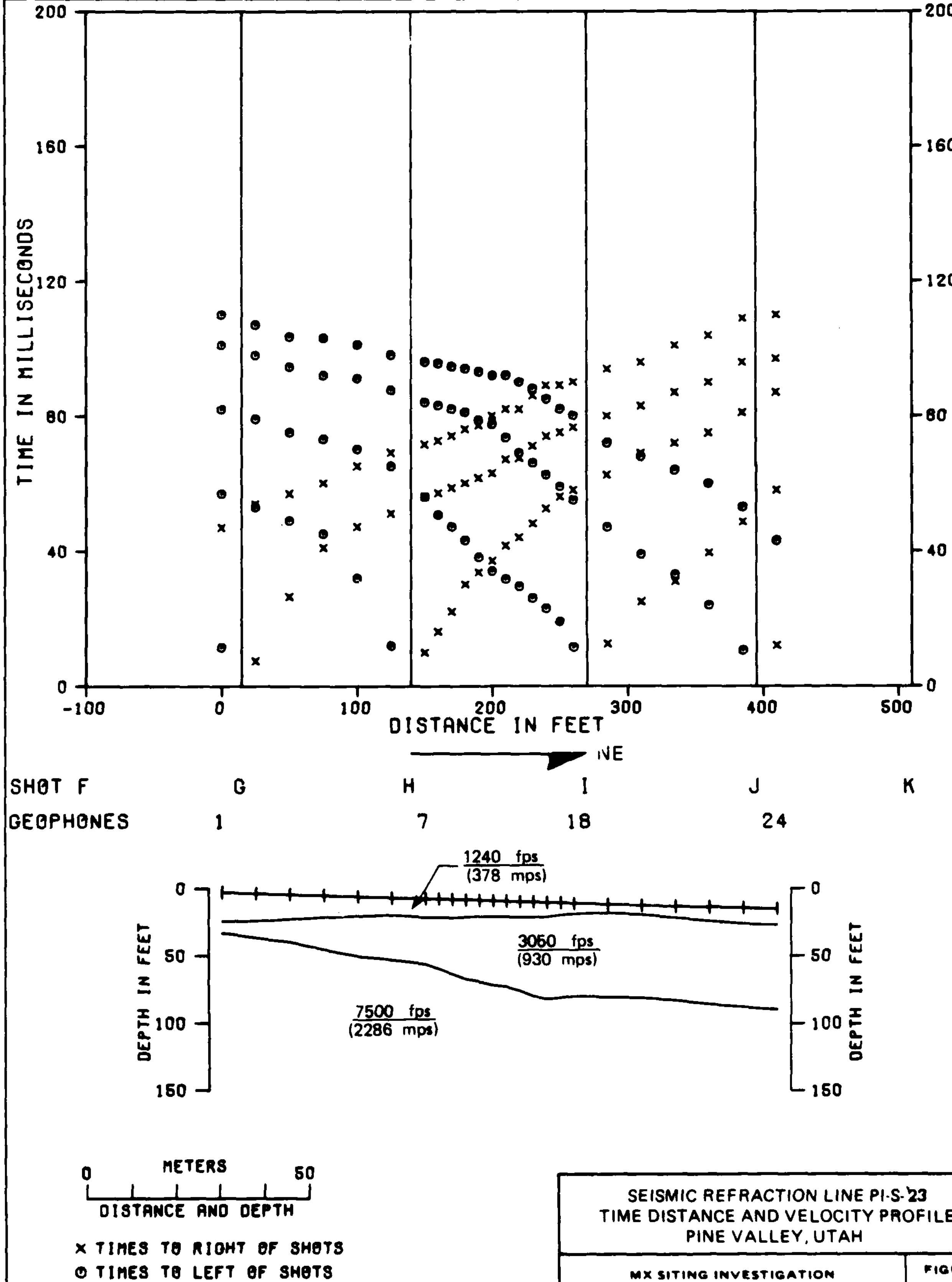


SEISMIC REFRACTION LINE PI-S-22
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE — BMO	FIGURE II-3-22

FUGRO NATIONAL, INC.

FN-TR-27-PI-II



SEISMIC REFRACTION LINE PI-S-23
TIME DISTANCE AND VELOCITY PROFILE
PINE VALLEY, UTAH

MX SITING INVESTIGATION

DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-3-23

FUGRO NATIONAL, INC.

24 MAR 81

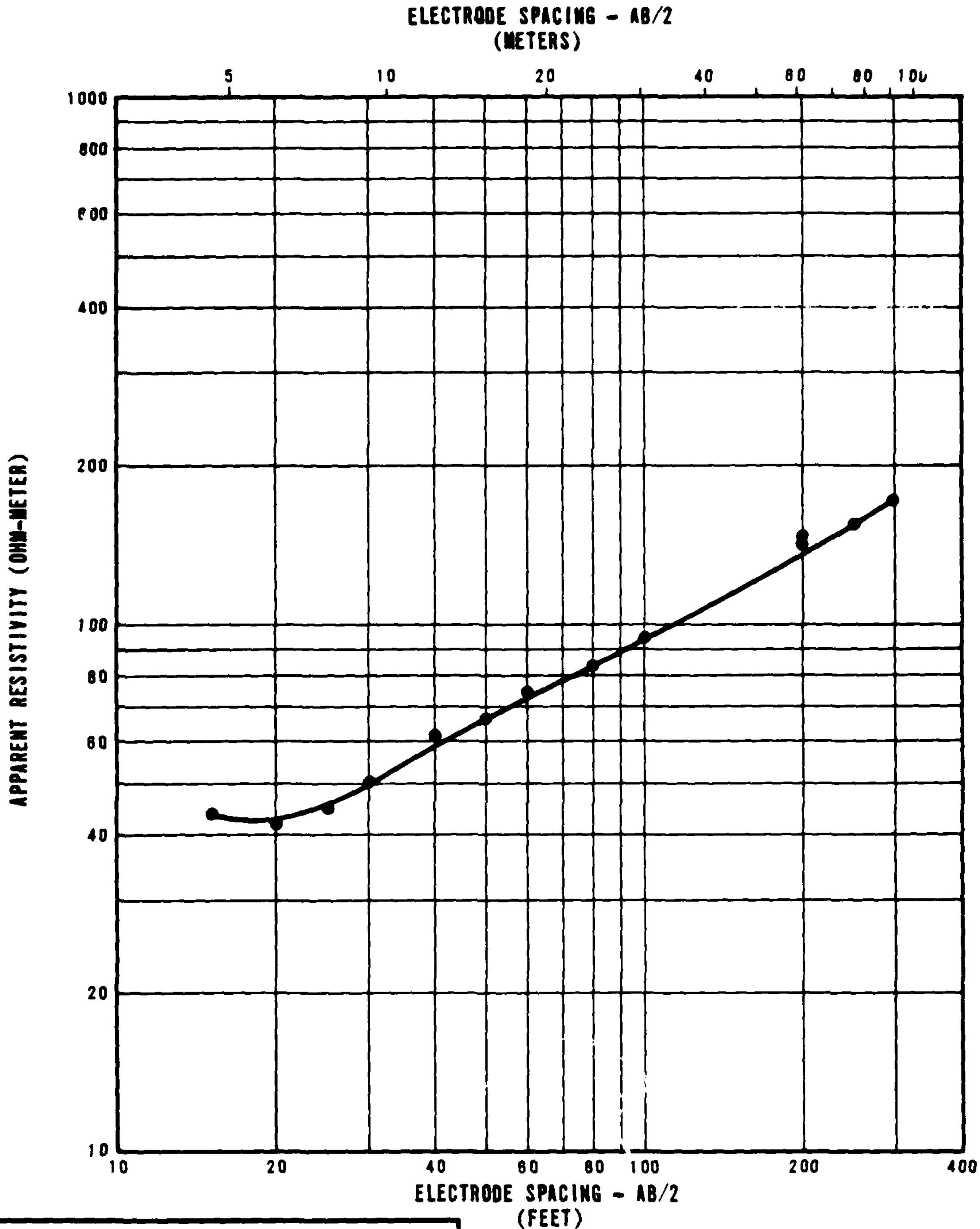
4.0 ELECTRICAL RESISTIVITY DATA

Explanation: Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.

Note: The resistivity measurements scheduled for location R-17 were not made due to interference from a fence and pipeline.



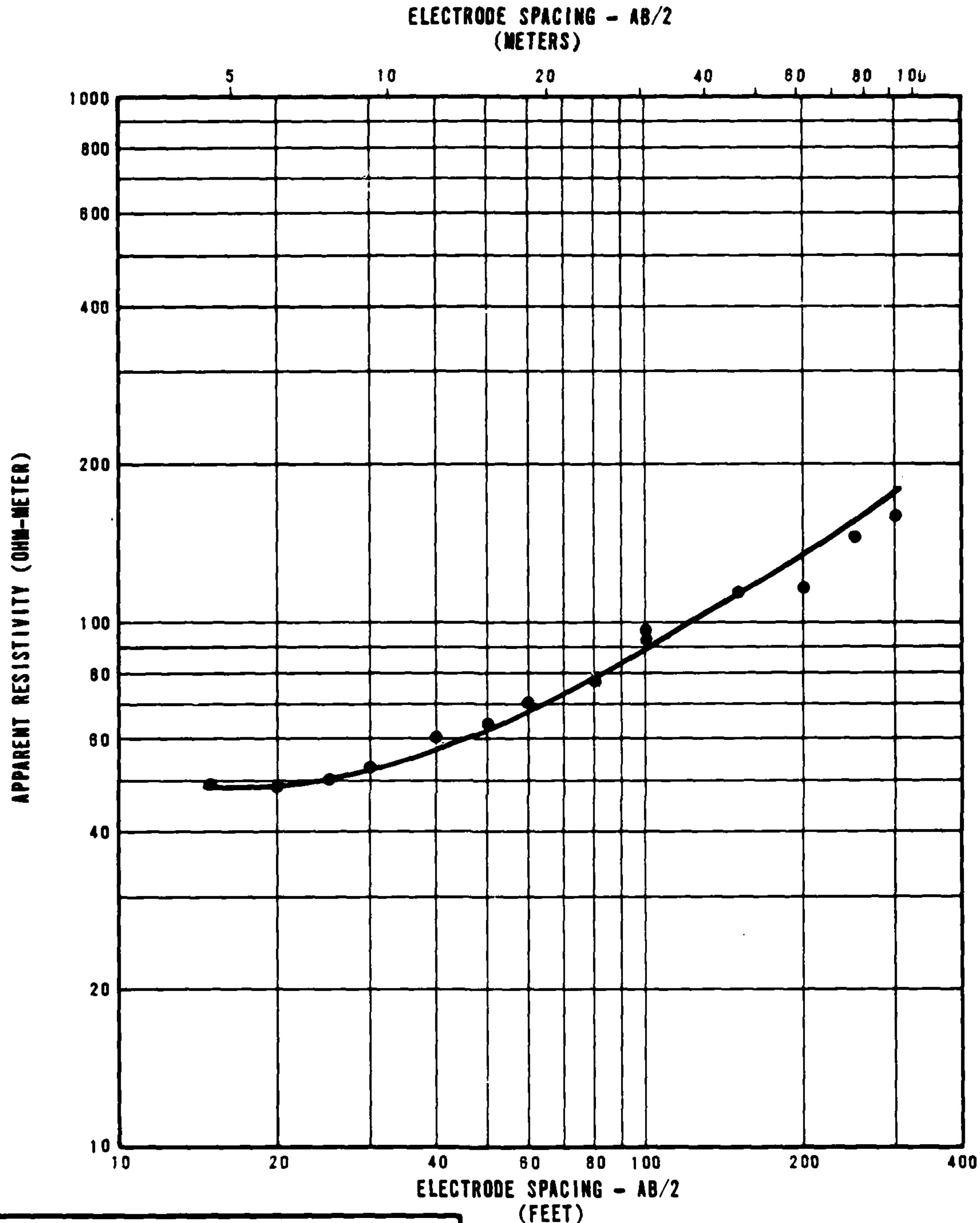
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
6	2	30
21	6	330

RESISTIVITY SOUNDING PI-R-1
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-1

FUGRO NATIONAL, INC.



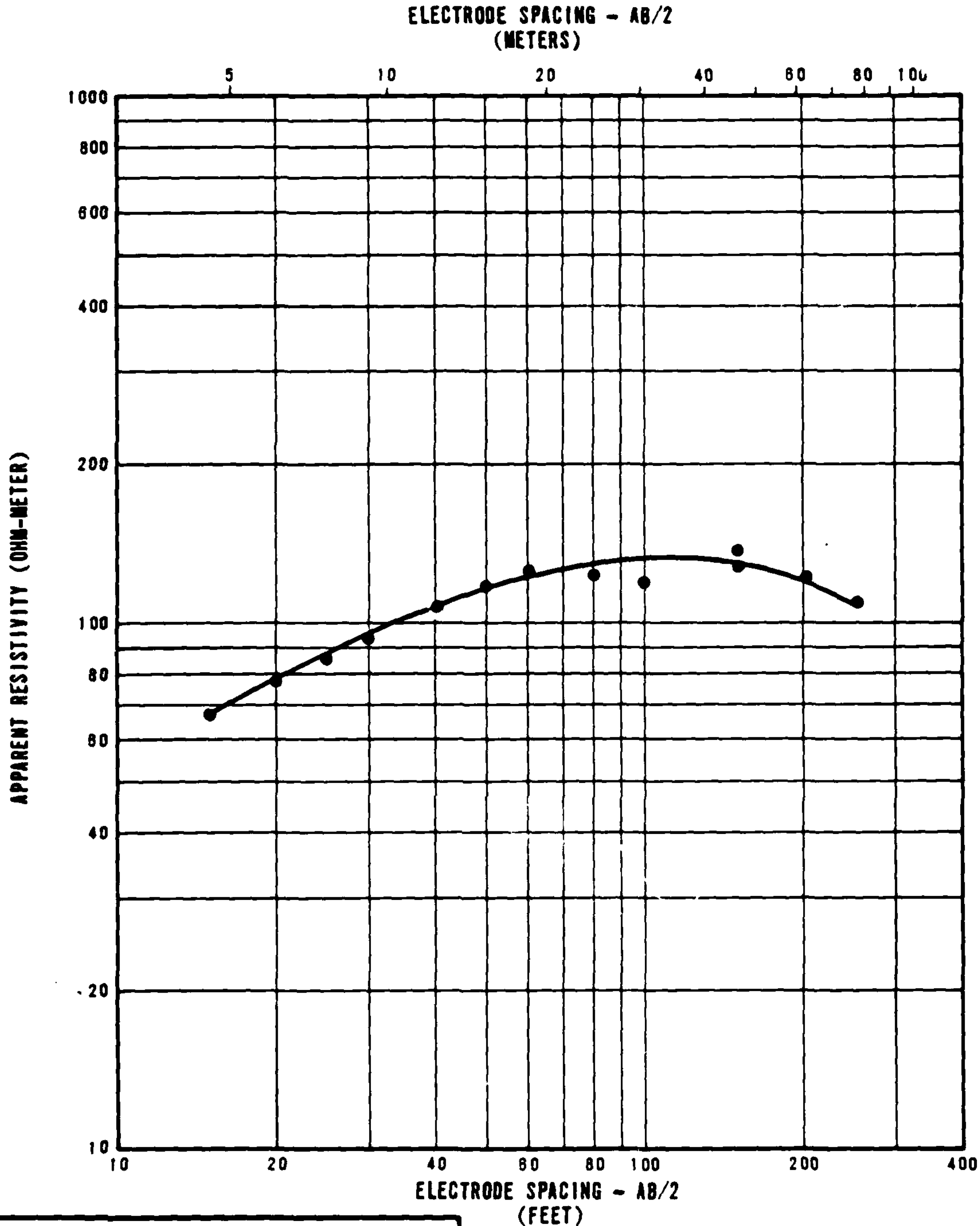
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
12	4	19
15	5	100
87	27	390

RESISTIVITY SOUNDING PI-R-2
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-2

FUGRO NATIONAL, INC.



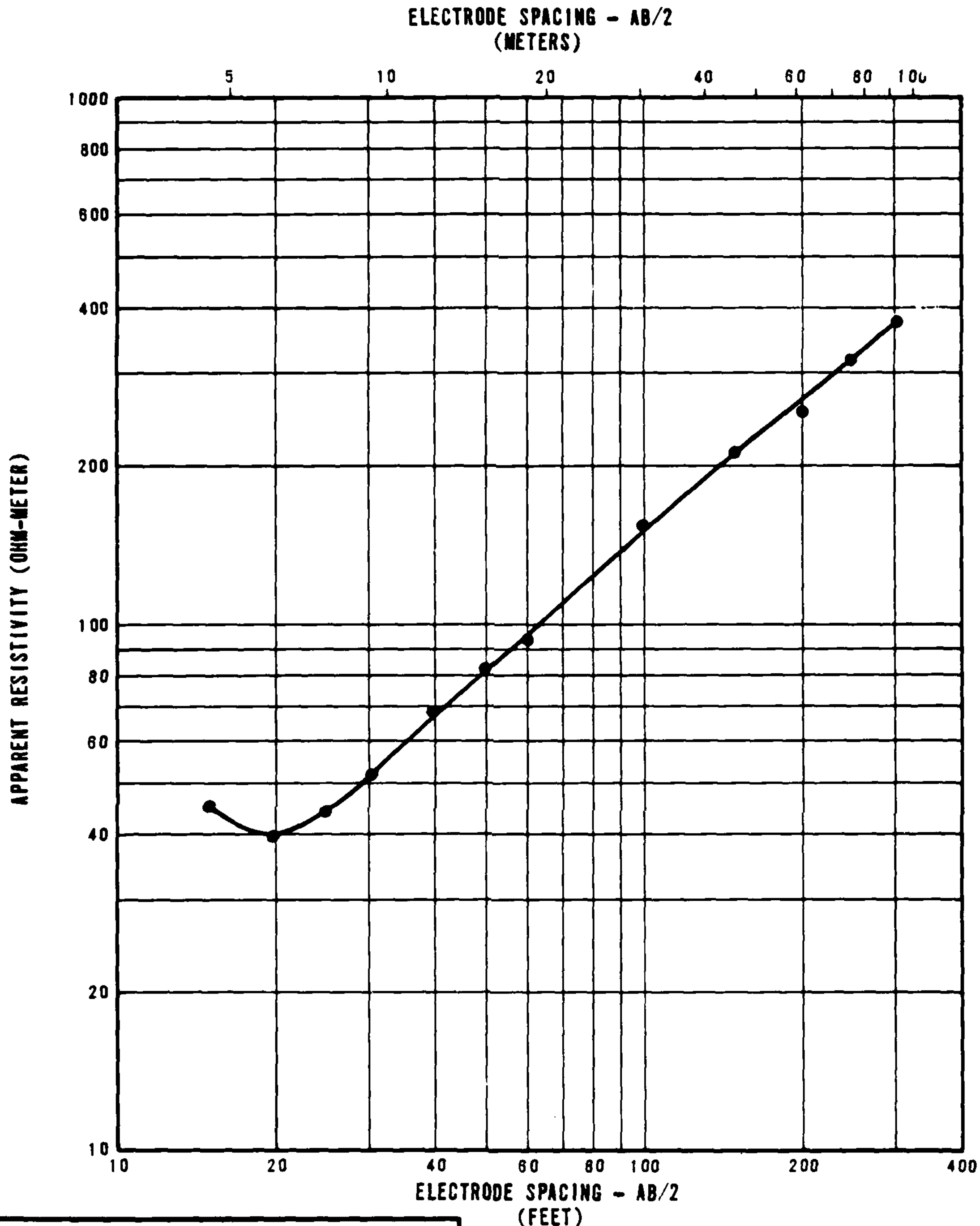
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
8	2	150
104	32	80
155	47	150

RESISTIVITY SOUNDING PI-R-3
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-3

FUGRO NATIONAL, INC.



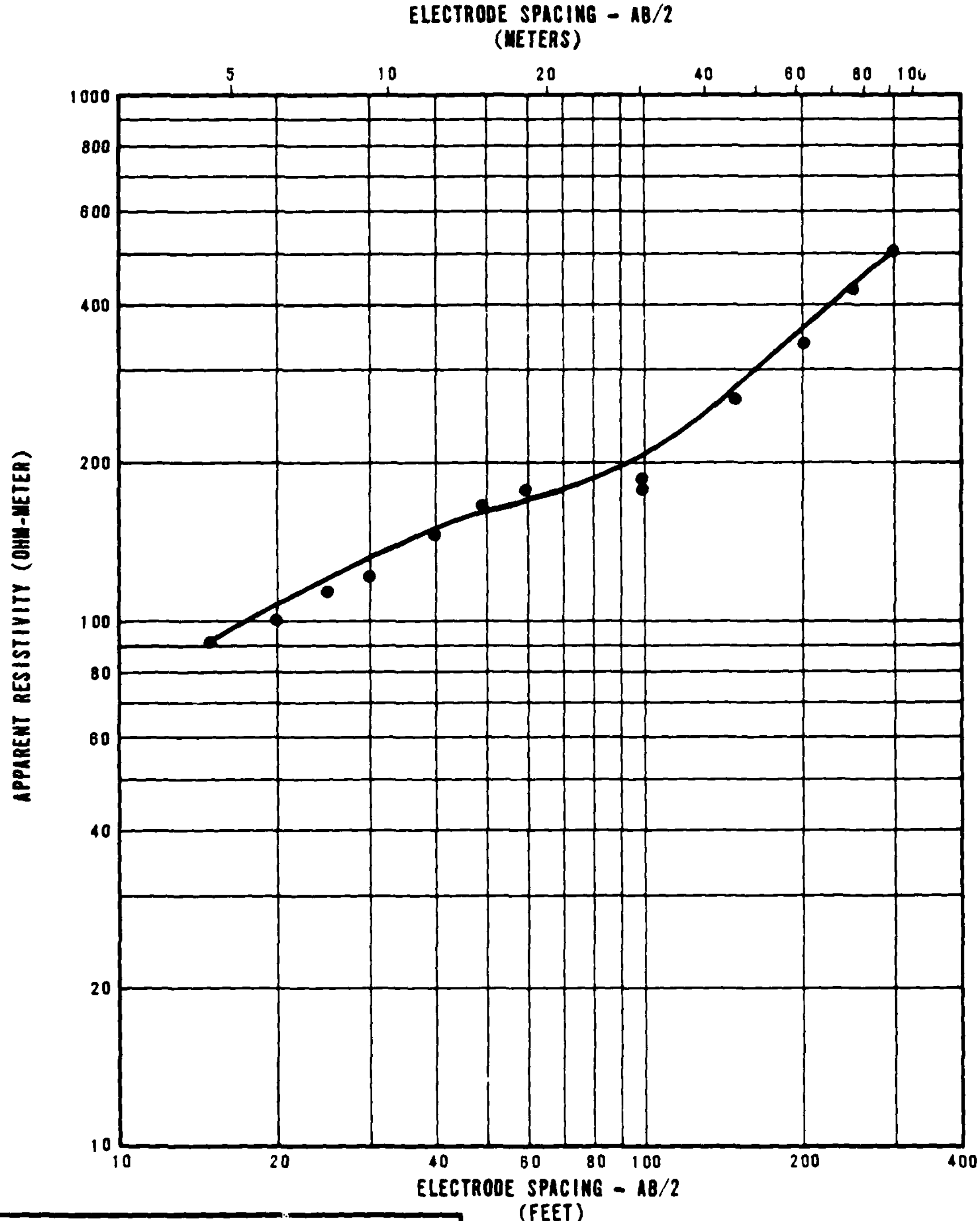
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	40
13	4	25
21	6	350
30	9	850

RESISTIVITY SOUNDING PI-R-4,
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-4

FUGRO NATIONAL, INC.



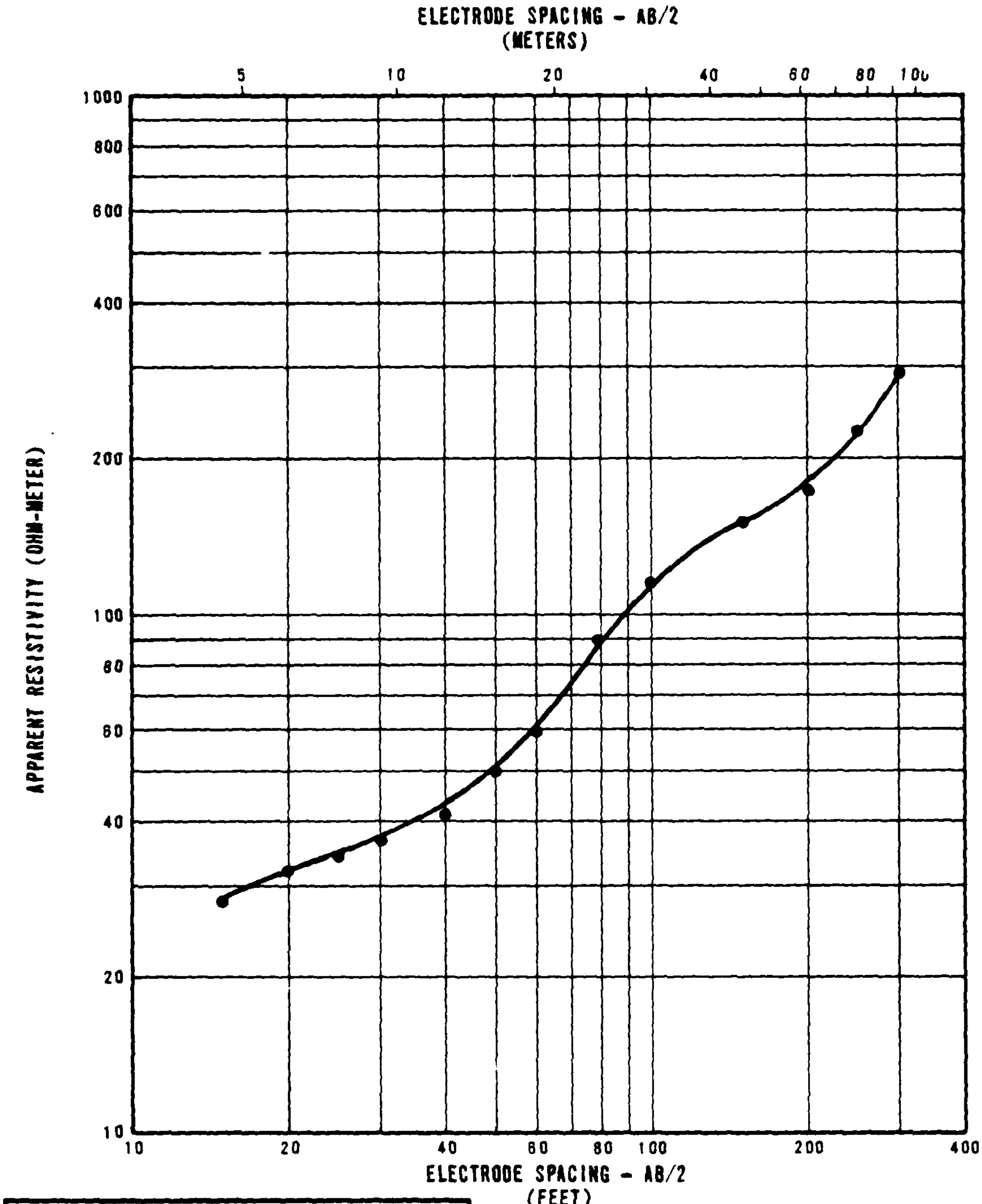
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	56
5	2	170
33	10	120
52	16	450

RESISTIVITY SOUNDING PI-R-5
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-5

FUGRO NATIONAL, INC.



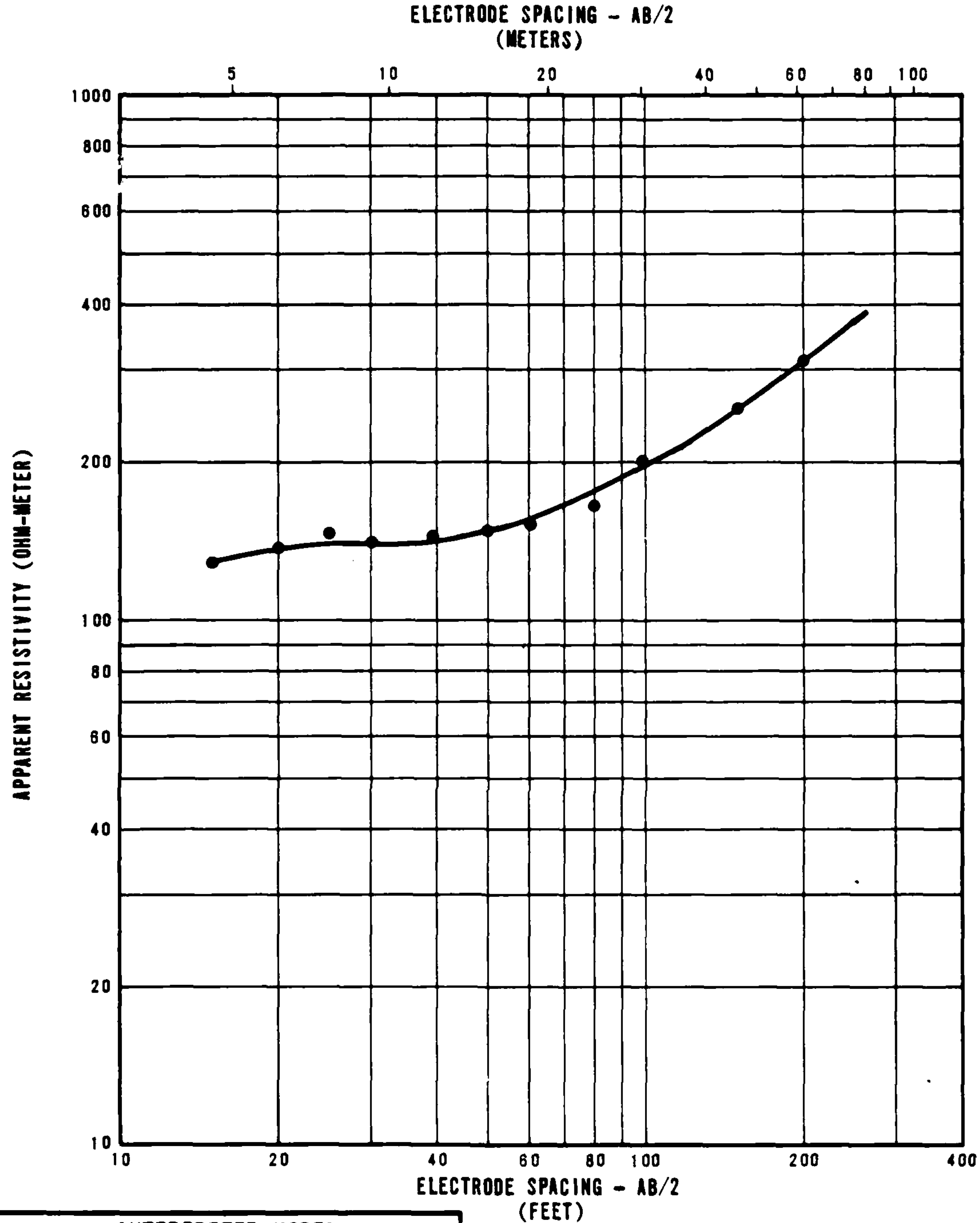
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	30
16	5	140
58	17	480
80	24	800
111	34	1560

RESISTIVITY SOUNDING PI-R-6,
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-6

FUGRO NATIONAL, INC.



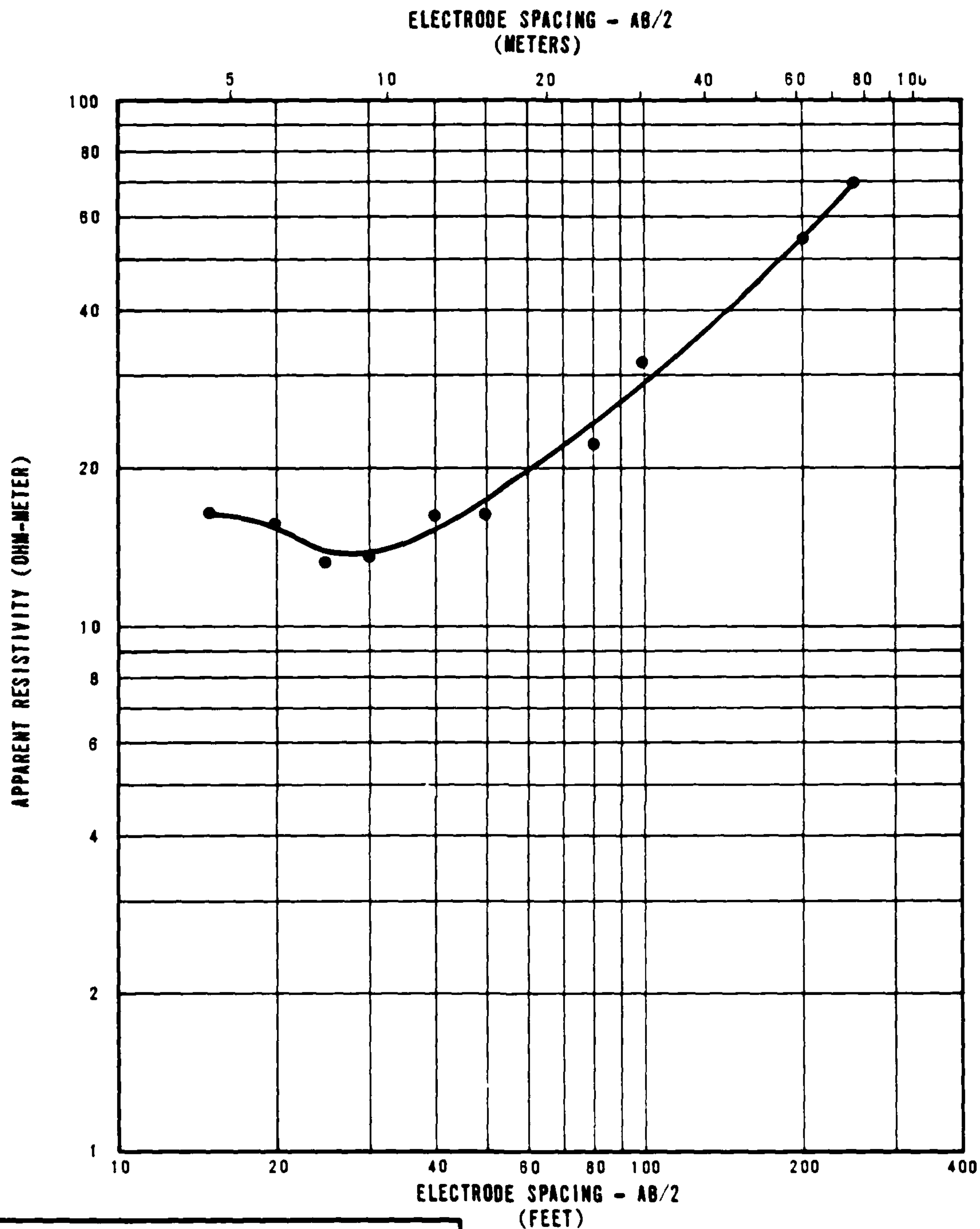
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
37	11	260
76	23	490
102	31	170
120	37	4100

RESISTIVITY SOUNDING PI-R-7
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-7

FUGRO NATIONAL, INC.



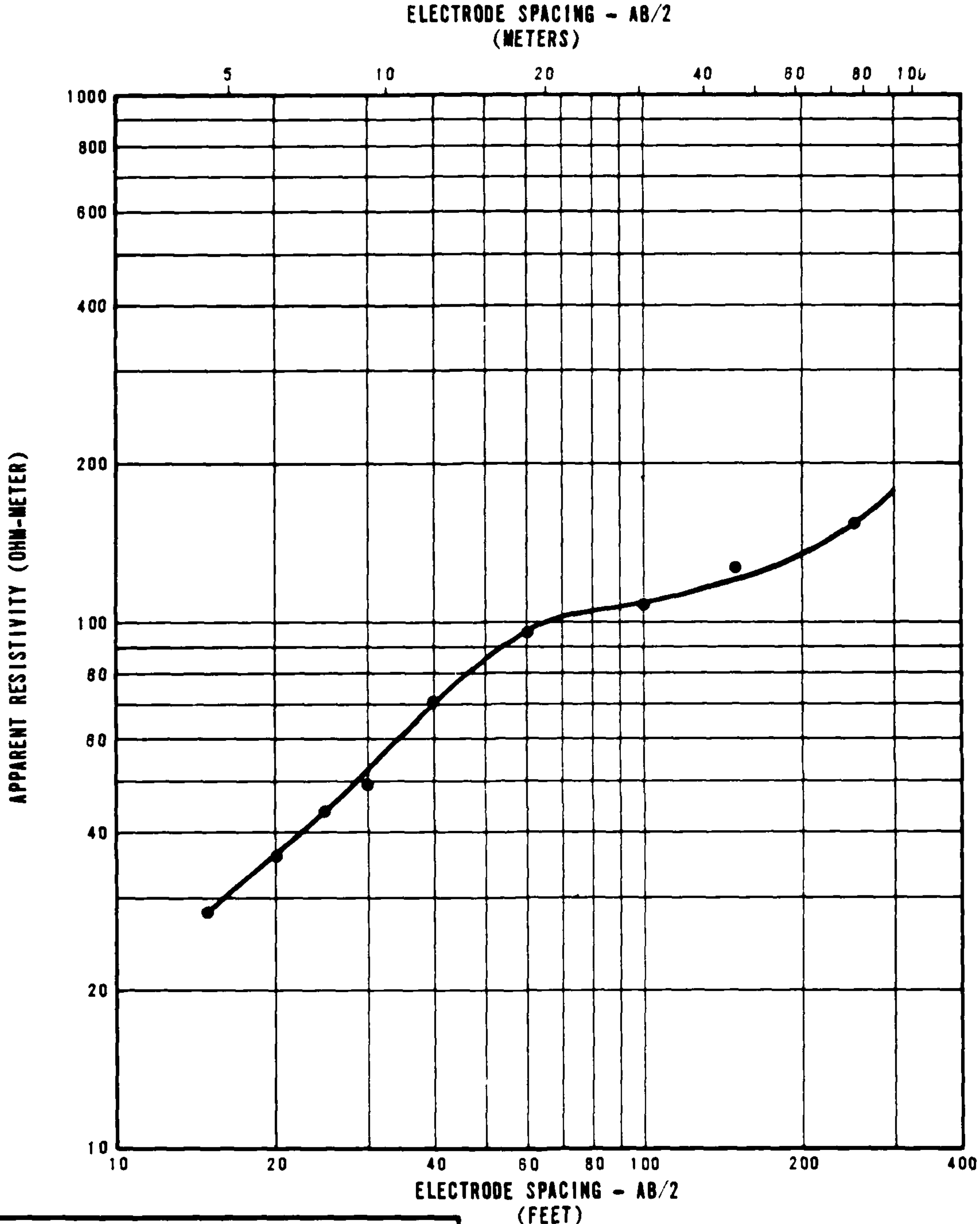
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	20
10	3	7
18	5	20
45	14	85
82	25	1730

RESISTIVITY SOUNDING PI-R-8
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-4-8

FUGRO NATIONAL, INC.



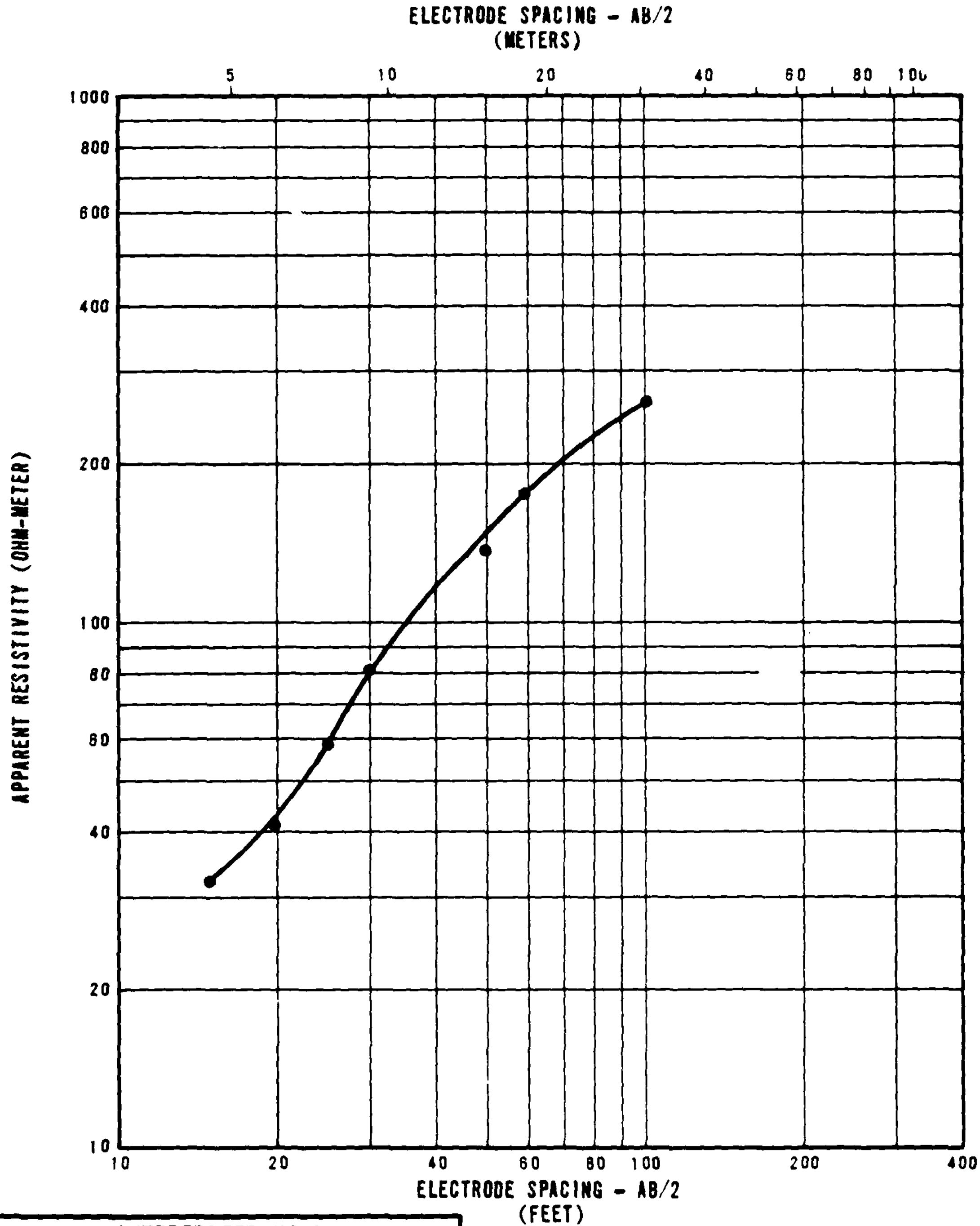
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	14
6	2	65
15	5	840
26	8	70
110	34	4850

RESISTIVITY SOUNDING PI-R-9
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-9

FUGRO NATIONAL, INC.



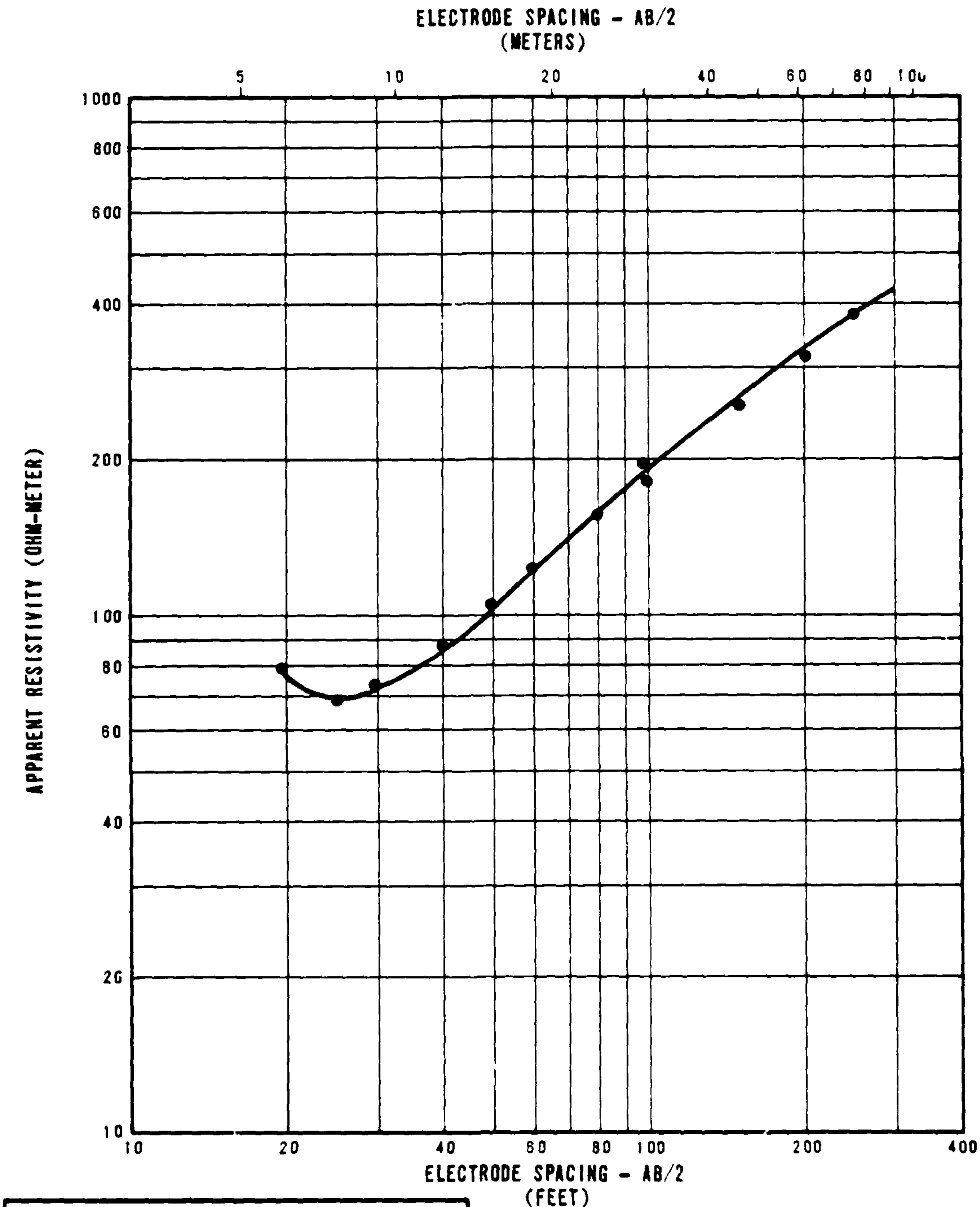
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	45
10	3	660

RESISTIVITY SOUNDING PI-R-10
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-10

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
19	6	490
62	19	910

RESISTIVITY SOUNDING PI-R-11
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

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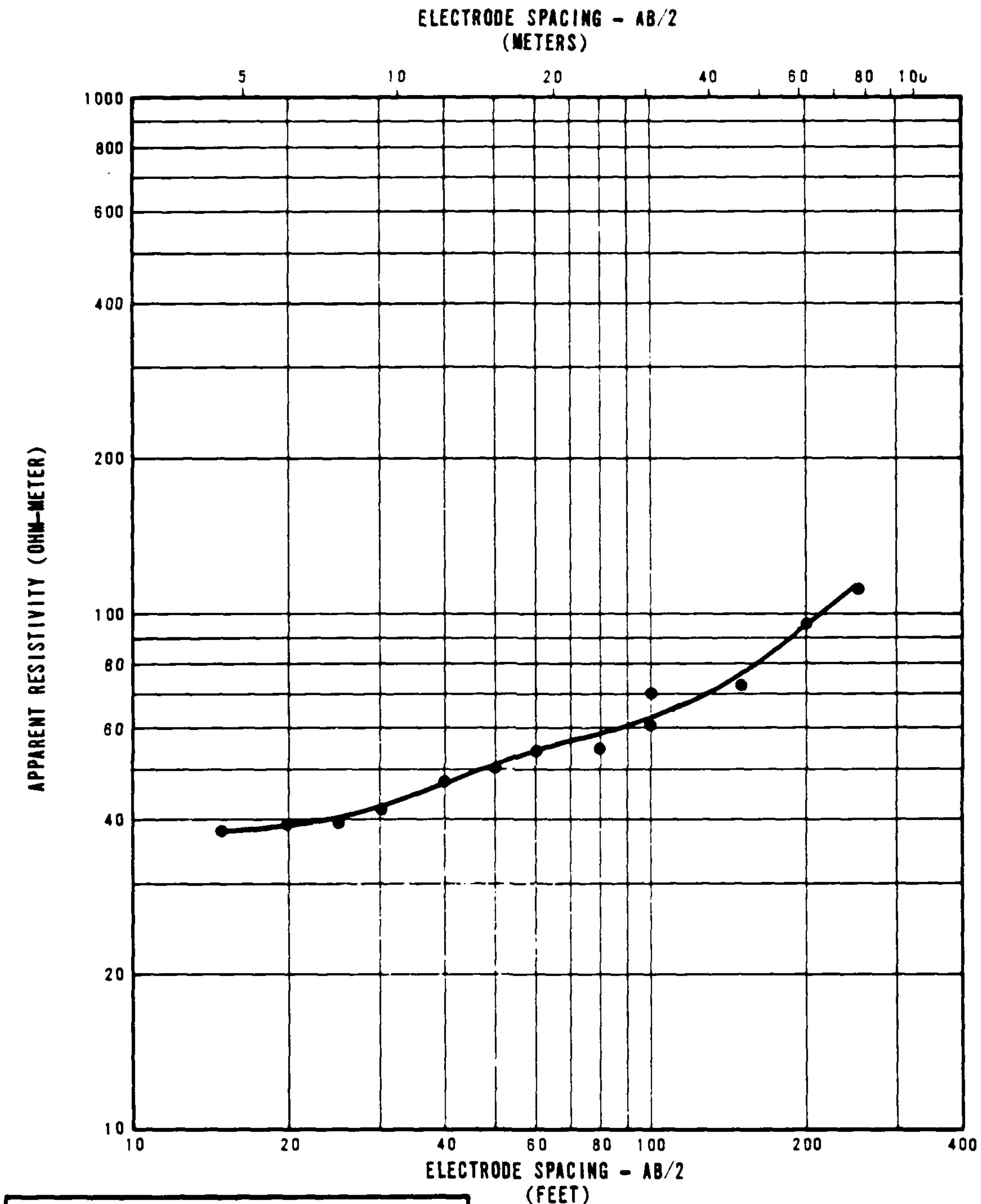
FIGURE
II-4-11

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	35
21	6	60
118	36	180
158	48	3610

RESISTIVITY SOUNDING PI-R-12
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

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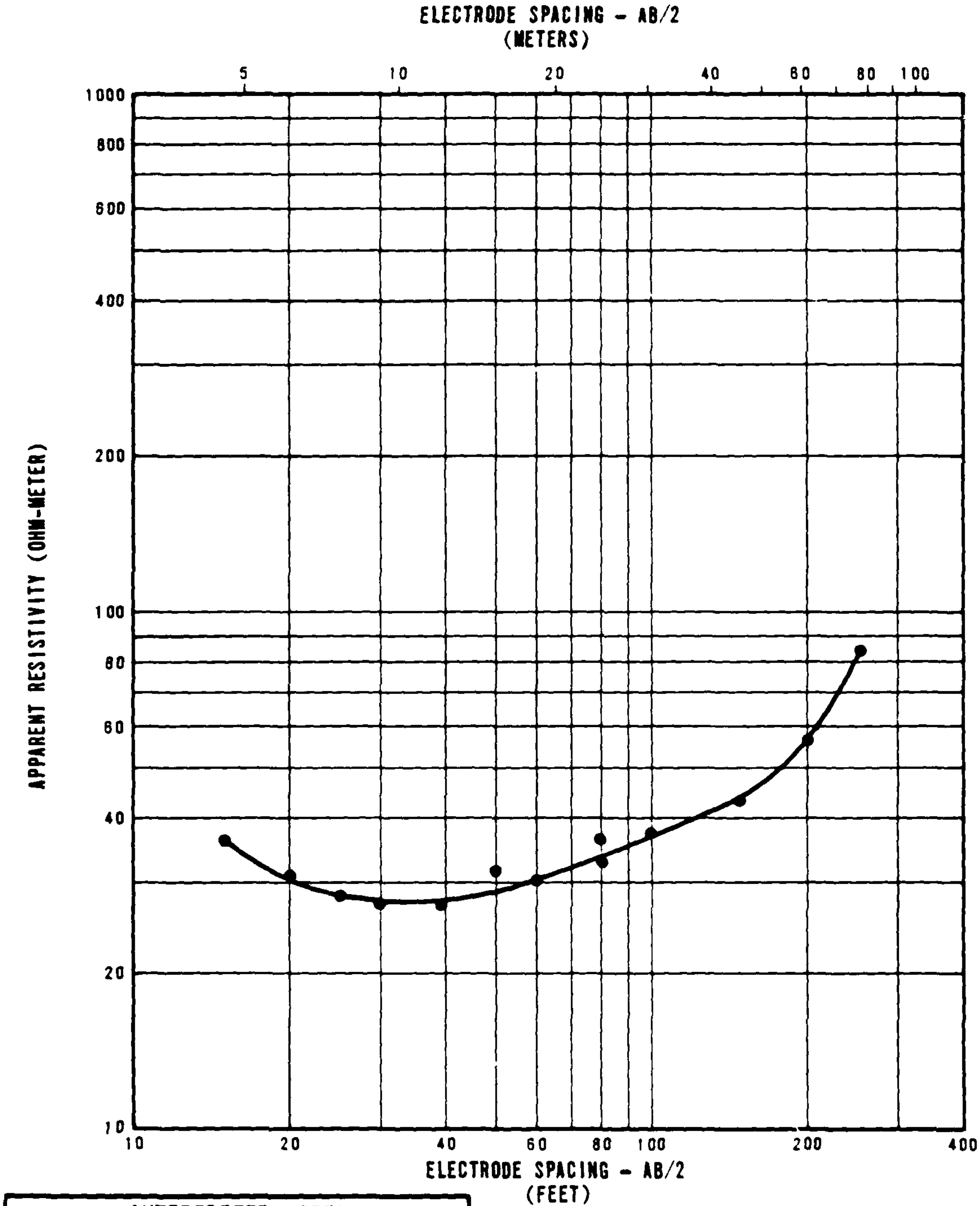
FIGURE
II-4-12

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
5	2	25
26	8	45
40	12	25
103	31	260
131	40	3480

RESISTIVITY SOUNDING PI-R-13
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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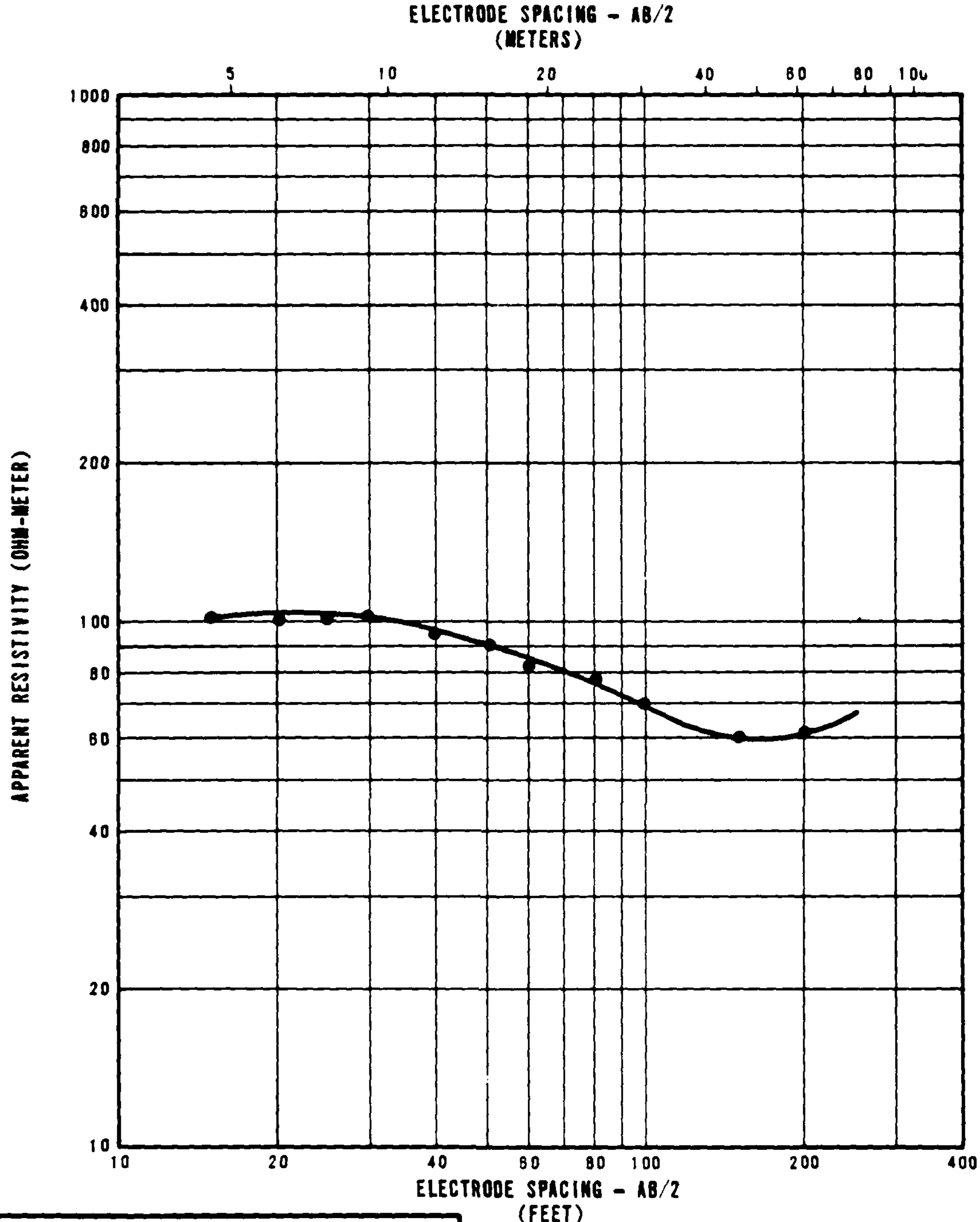
FIGURE
II-4-13

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	100
41	12	40
144	44	110

RESISTIVITY SOUNDING PI-R-14
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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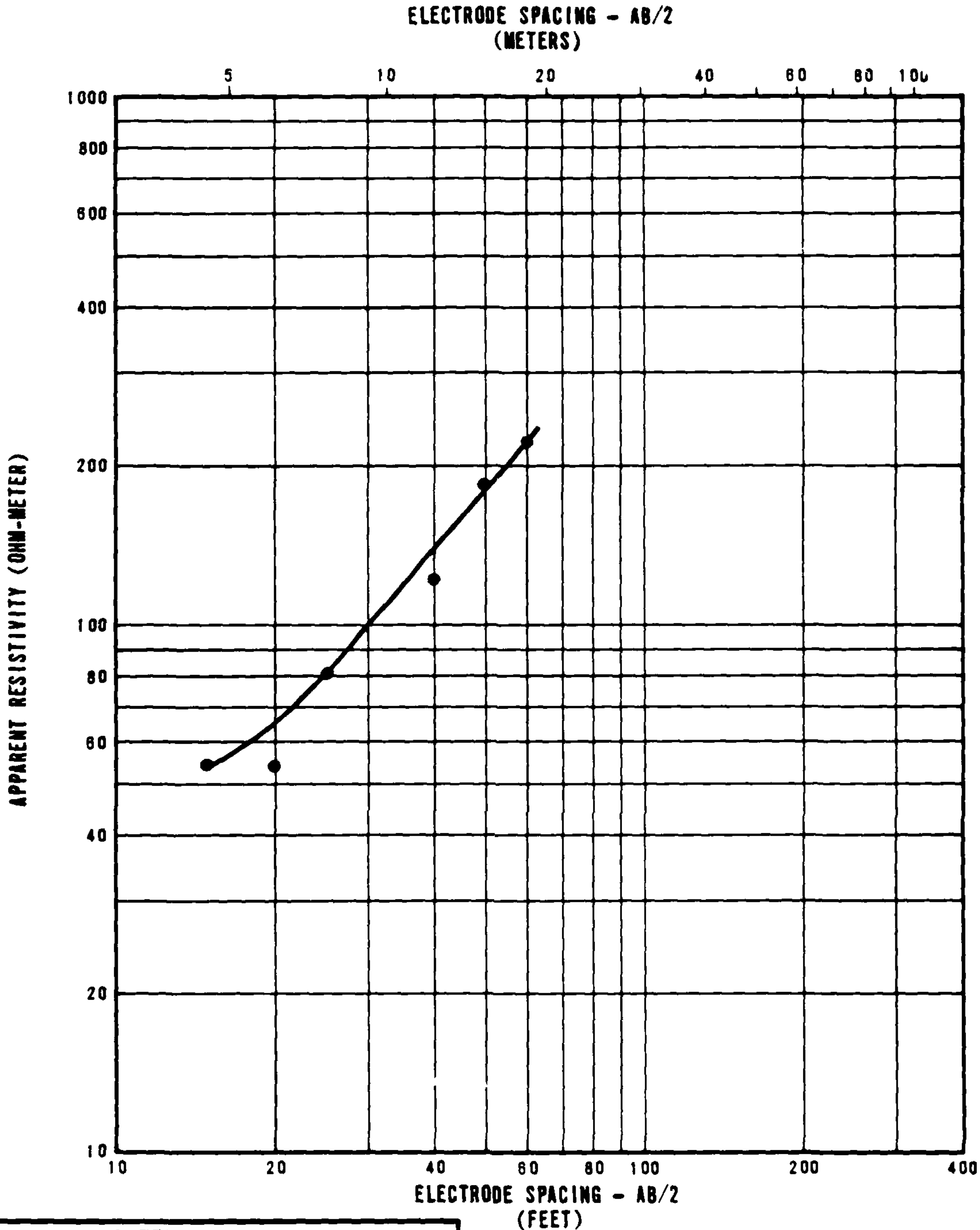
FIGURE
II-4-14

FUGRO NATIONAL, INC.



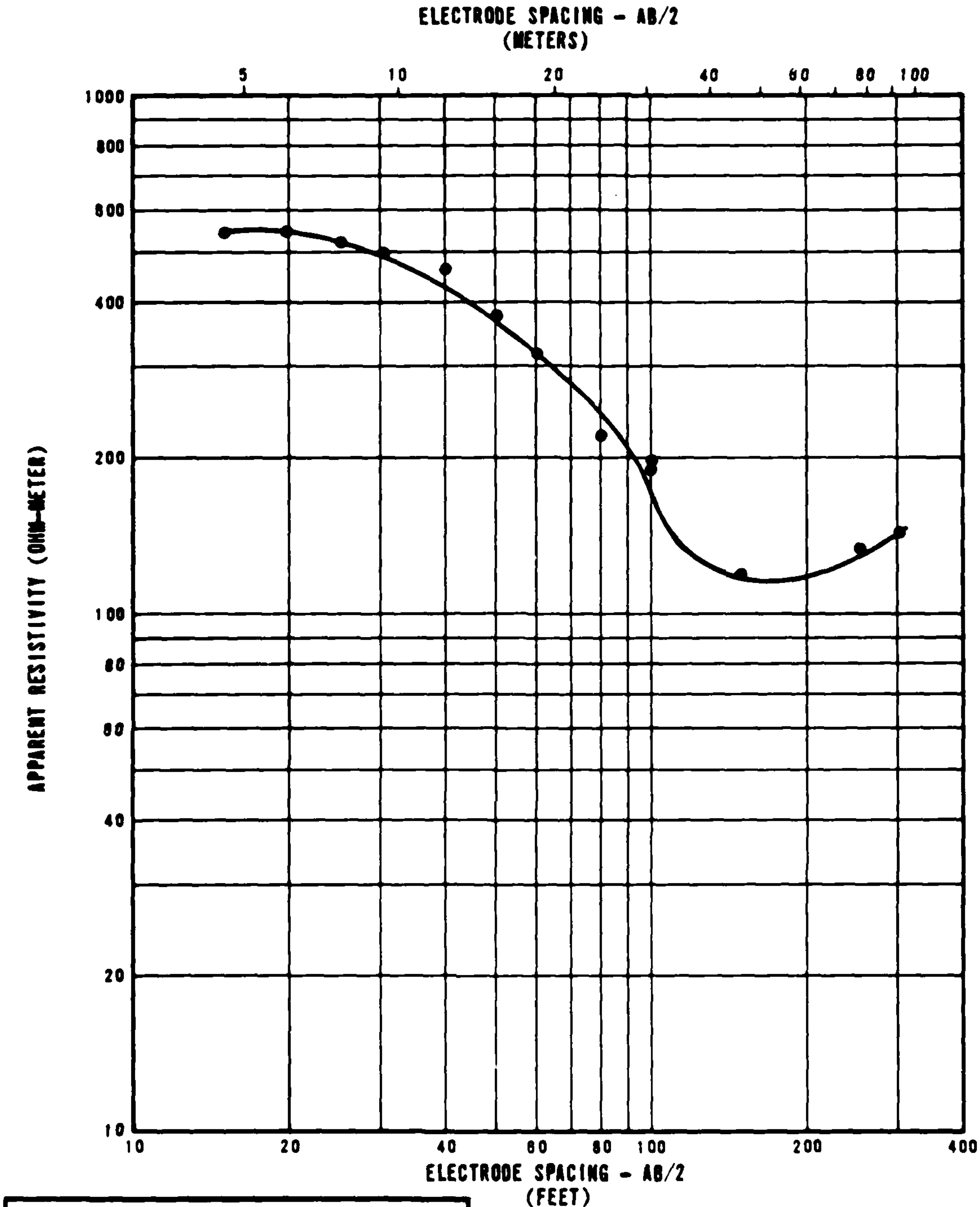
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
17	5	640
27	8	2000

RESISTIVITY SOUNDING PI-R-15
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-15

FUGRO NATIONAL, INC.



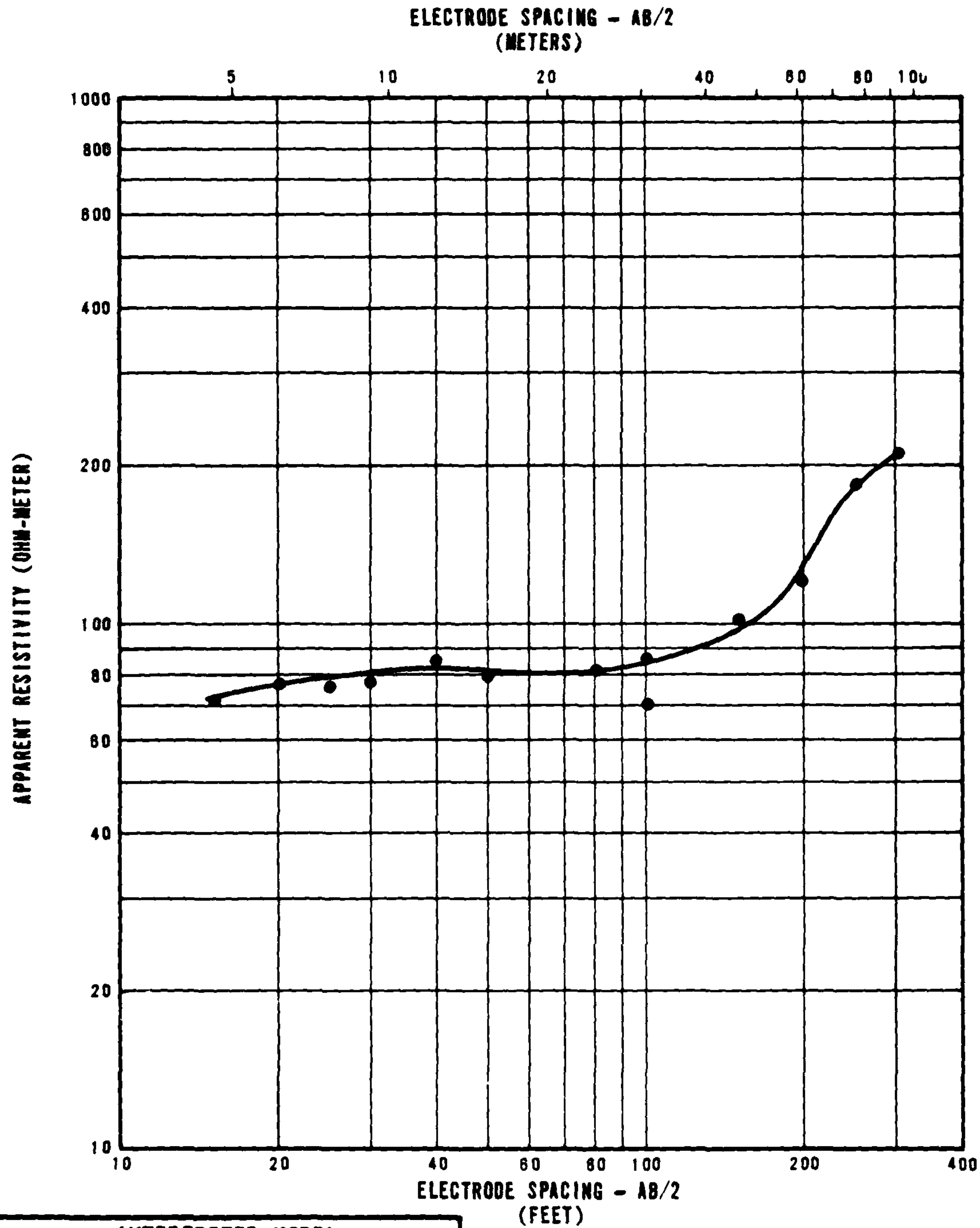
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	540
22	7	330
33	10	200
57	17	80
143	44	200

RESISTIVITY SOUNDING PI-R-16
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-4-16

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	65
6	2	85
25	7	60
73	22	260

RESISTIVITY SOUNDING PI-R18
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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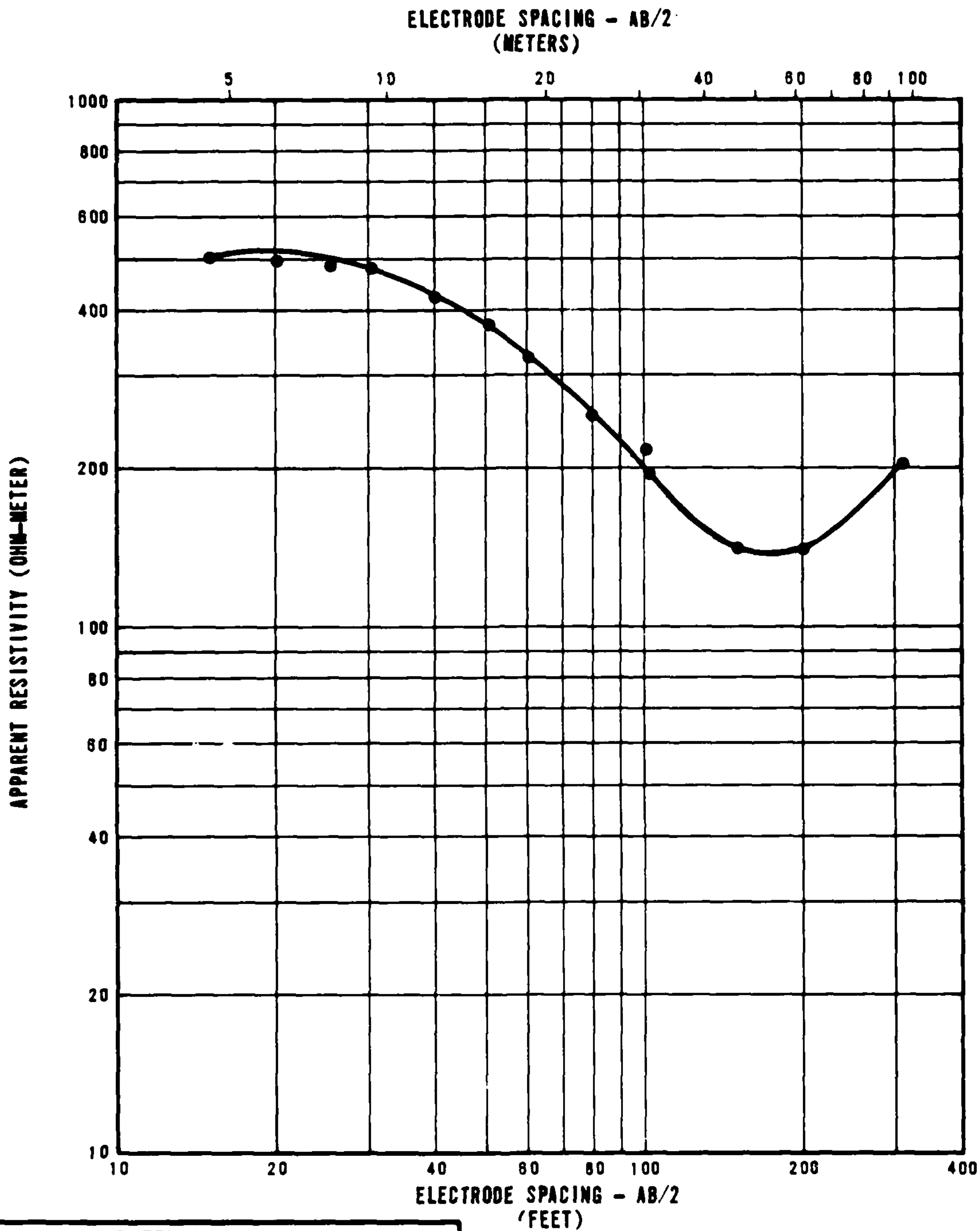
FIGURE
II-4-17

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	450
8	2	760
15	5	340
48	15	60
119	36	1020

RESISTIVITY SOUNDING PI-R-19
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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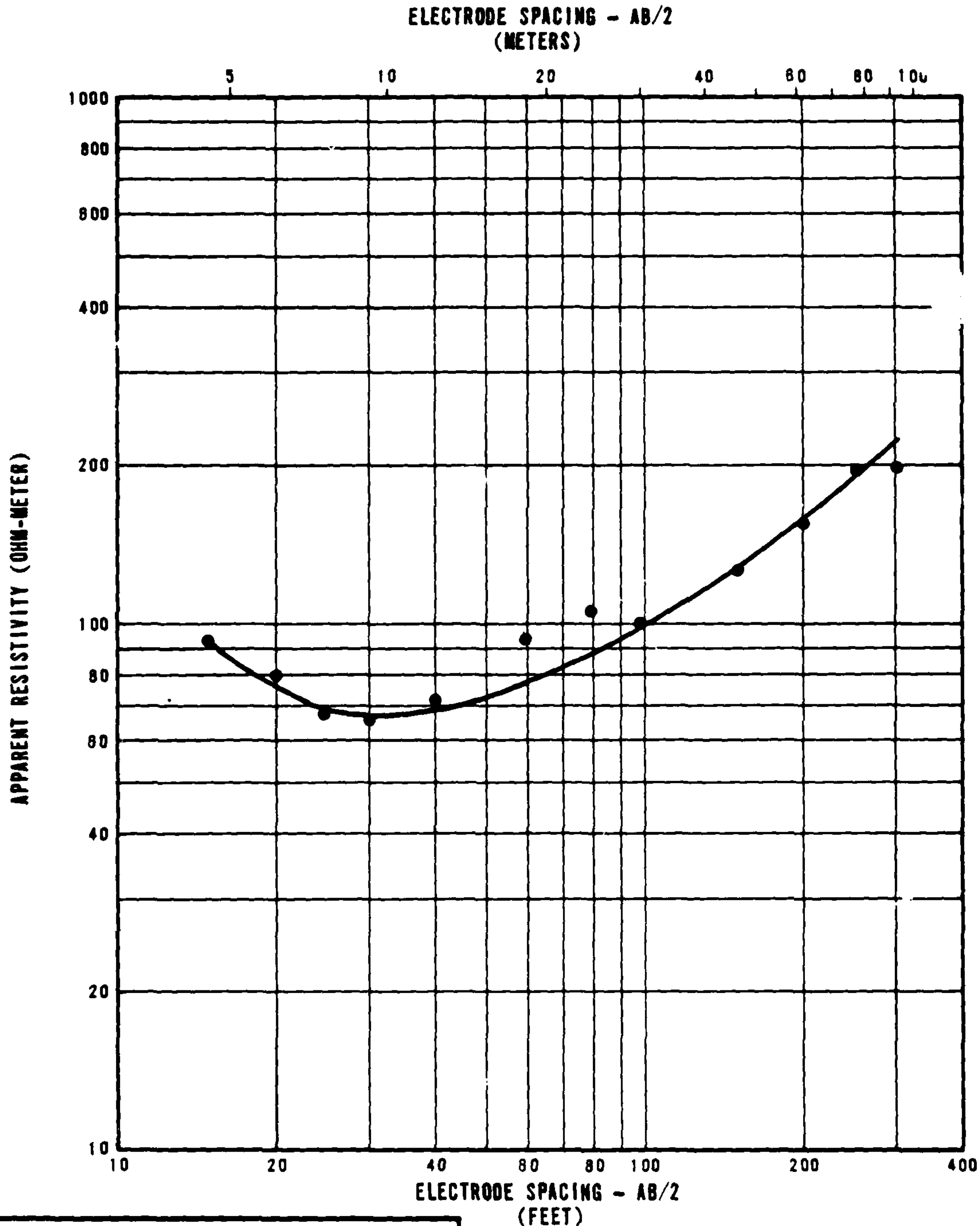
FIGURE II-4-18

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	130
6	2	65
40	12	100
72	22	150
140	43	3130

RESISTIVITY SOUNDING PI-R-20
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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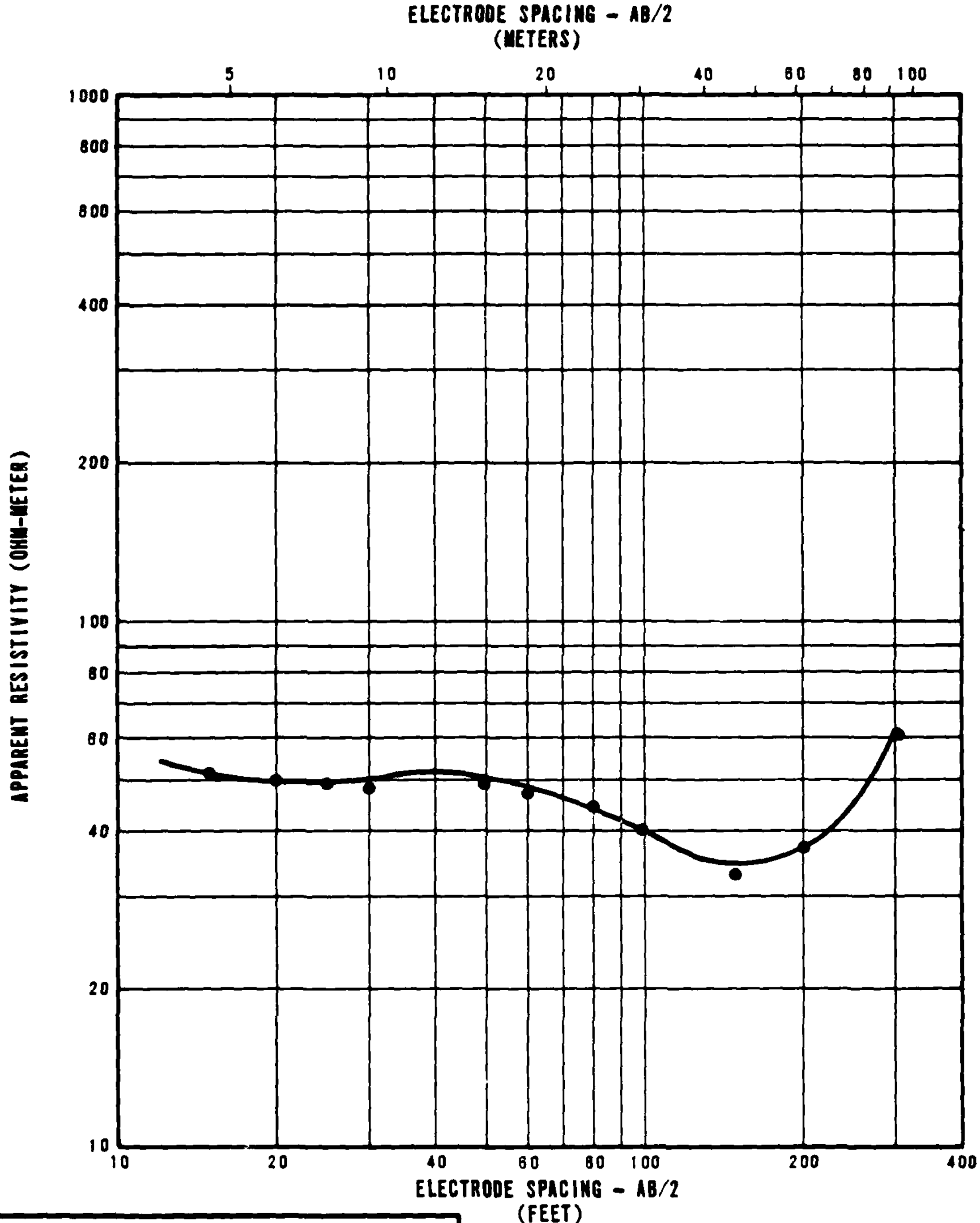
FIGURE
II-4-19

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	55
46	14	13
92	28	40
139	42	2140

RESISTIVITY SOUNDING PI-R-21
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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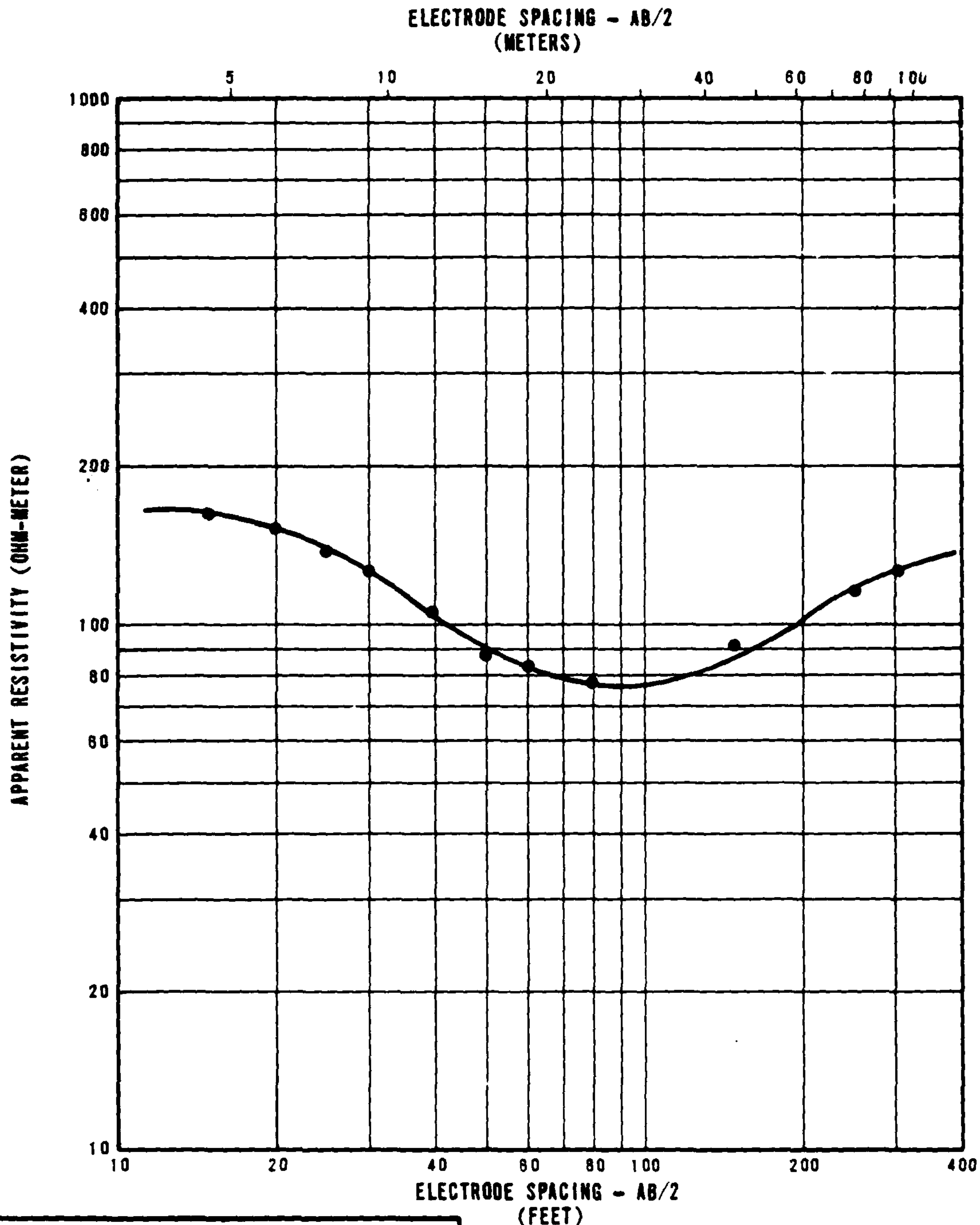
FIGURE II-4-20

FUGRO NATIONAL, INC.



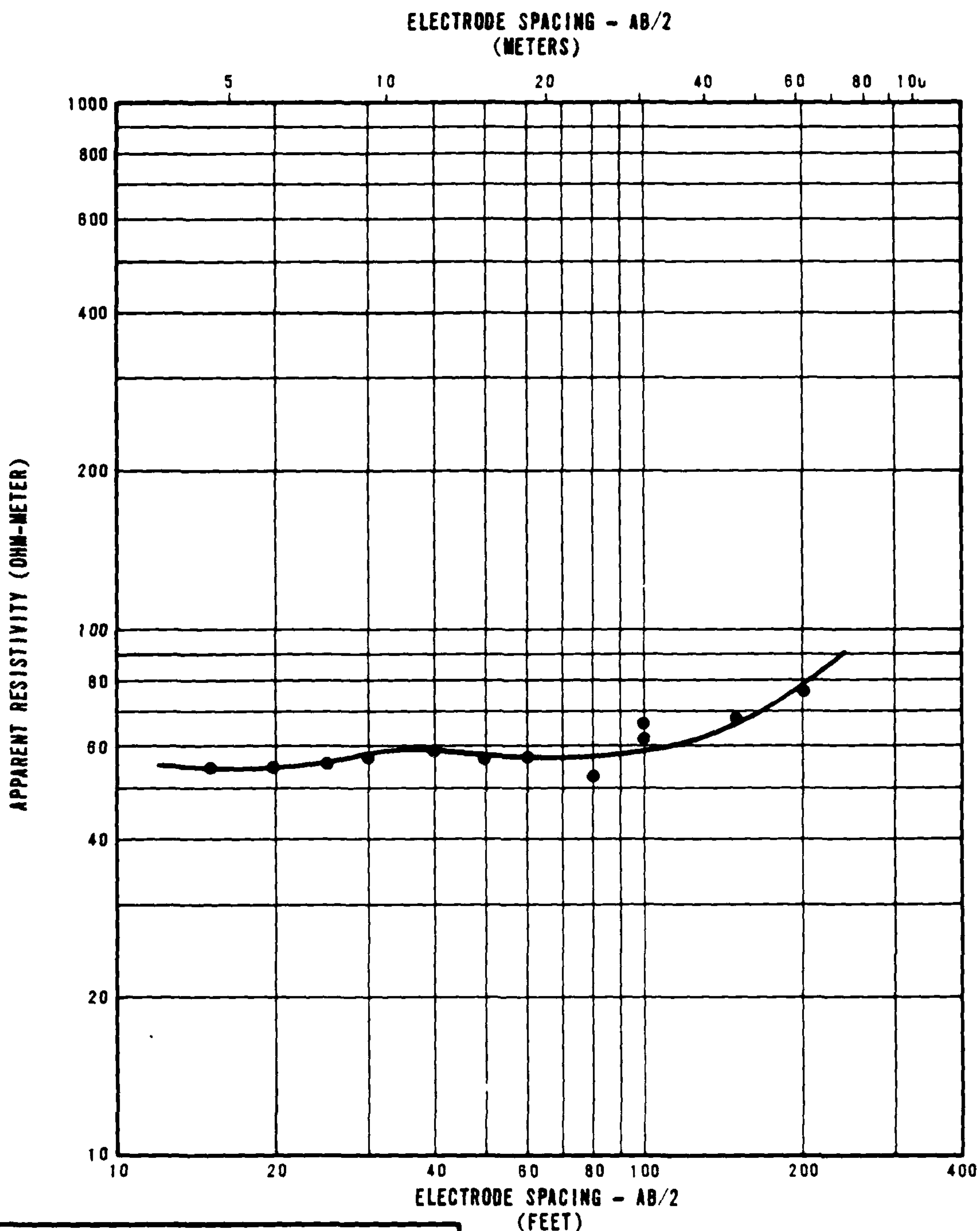
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	170
16	5	60
91	28	210

RESISTIVITY SOUNDING PI-R-22
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-4-21

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	50
89	27	80
150	46	880

RESISTIVITY SOUNDING PI-R-23
SOUNDING CURVE AND INTERPRETATION
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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FIGURE
II-4-22

FUGRO NATIONAL, INC.

5.0 BORING, TRENCH, AND TEST PIT LOGS

Note: Borings PI-B-3 and PI-B-4 were drilled to determine depth to rock. No samples were collected for laboratory testing.

Explanation: All data from borings and trenches are presented on standard Fugro National logs in Sections 5.0 and 6.0. Explanations of the column headings on the logs follow.

A. Designations - Borings and trenches are identified as follows:

PI-B-1
PI - abbreviation for the site (e.g., PI-Pine)
B - abbreviation for activity (e.g., B-boring, T-trench, P-test pit)
1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of sampling techniques, see Section A5.0 of Appendix in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table II-5-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in American Society for Testing and Materials (ASTM) procedure D 2487-69, Classification of Soils for Engineering Purposes, and D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

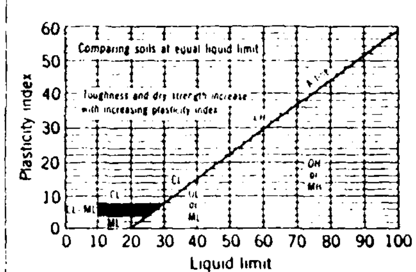
Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :

Dry	-	no feel of moisture
Slightly Moist	-	much less than normal moisture
Moist	-	normal moisture for soil
Very Moist	-	much greater than normal moisture
Wet	-	for soils below the water table

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)				Group Symbols [a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is *larger* than No. 200 sieve size[b]	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (*little or no fines*)	Wide range in grain size and substantial amounts of all intermediate particle sizes	*GW*	Well graded gravels, gravel-sand *mixtures*, little or no fines	Give typical name, indicate *approximate percentages* of sand and gravel, maximum size, angularity, surface condition, and hardness of the coarse grains, local or geologic name *and other pertinent descriptive* information; and symbols in parentheses	Use grain size curve in identifying the fractions as given under field identification Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows Less than 5%: *GW, GP, SW, SP* More than 12%: *GM, GC, SM, SC* 5% to 12%: *Borderline* cases requiring use of dual symbols $C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ *Between 1 and 3*
			Predominantly one size or a range of sizes with some intermediate sizes missing	*GP*	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not *meeting all gradation requirements* for *GW*
		Gravels with fines (*appreciable* amount of fines)	Nonplastic fines (for identification procedures see *ML* below)	*GM*	Silty gravels, poorly graded gravel-sand-silt *mixtures*	For undisturbed soils add information on stratification, *degree of* compactness, cementation, moisture conditions and *drainage characteristics*	Atterberg limits below "A" line, or *PI* less than 4 — Above "A" line with *PI* between 4 and 7 are *borderline* cases *requiring use of* dual symbols
			Plastic fines (for identification procedures, see *CL* below)	*GC*	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with *PI* greater than 7
	Sands More than *half of* coarse fraction is smaller than No. 4 sieve size	Clean sands (*little or no* fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	*SW*	Well graded sands, gravelly sands, little or no fines	Example: *Silty sand*, gravelly, about 20% hard, angular gravel particles ½-in *maximum size*, rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place, *alluvial sand*; (*SM*)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing	*SP*	Poorly graded sands, gravelly sands, little or no fines		Not *meeting* all gradation requirements for *SW*
		Sands with fines (*appreciable* amount of fines)	Nonplastic fines (for identification procedures, *see ML below)*	*SM*	Silty sands, poorly graded sand-*silt mixtures*		Atterberg limits below "A" line or *PI* less than 5 — Above "A" line with *PI* between 4 and 7 are *borderline* cases *requiring use of* dual symbols
			Plastic fines (for identification procedures, see *CL* below)	*SC*	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits below "A" line with *PI* greater than 7

Identification Procedures on Fraction Smaller than No. 40 Sieve Size		*Dry Strength* (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency *near plastic* limit)	Group Symbols [a]	Typical Names	Information Required for Describing Soils
Fine-grained soils More than half of material is *smaller* than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to naked eye)	Silts and clays liquid limit less than 50	None to *slight*	Quick to *slow*	None	*ML*	Inorganic silts and very fine sands, rock flour, silty or *clayey* fine sands with slight plasticity	Give typical name, indicate degree and character of plasticity, *amount and maximum size of* coarse grains; colour in wet condition, *odour if any*, local or geologic name, and other pertinent descriptive information, *and symbol in parentheses*
		Medium to high	None to very slow	Medium	*CL*	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	For undisturbed *soils add information* on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions
		Slight to medium	Slow	Slight	*OL*	Organic silts and organic silt-clays of low plasticity	Example: *Clayey silt*, brown, slightly plastic, *small percentage of* fine sand, numerous vertical root holes, firm and dry in place, loess, (*ML*)
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	*MH*	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
		High to very high	None	High	*CH*	Inorganic clays of high plasticity, fat clays	
		Medium to high	*None to* very slow	*Slight to* medium	*OH*	*Organic* clays of medium to high plasticity	
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture			*Pt*	Peat and other highly organic soils	



Plasticity chart for laboratory classification of fine grained soils

From Wagner, 1957.

[a] *Boundary classifications* Soils possessing characteristics of two groups are designated by combinations of group symbols. For example *GW GC*, well graded gravel-sand mixture with clay binder.

[b] All sieve sizes on this chart are U S standard.

Field Identification Procedure for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately 1/64 in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests

Dilatancy (Reaction to shaking)

After removing particles larger than No 40 sieve size, prepare a pat of moist soil with a volume of about one-half cubic inch. Add *enough water if necessary* to make the soil soft but not sticky

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other *hand several times* A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy *When the sample is squeezed between the fingers*, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles The rapidity of appearance of water during shaking and of its disappearance during squeezing assist in identifying the character of the fines in a soil

Very fine clean sands give the quickest and most distinct reaction *whereas a plastic clay has no reaction* Inorganic silts, such as a typical rock flour, show a moderately quick reaction

Dry Strength (Crushing characteristics)

After removing particles larger than No. 40 *sieve size*, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by *breaking and crumbling between the fingers* This strength is a measure of the character and quantity of the colloidal fraction contained in the soil The dry strength increases with increasing plasticity

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength Silty fine sands and silts have *about the same slight* dry strength, but can be distinguished by the feel when powdering the dried specimen Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency *near plastic limit*)

After removing particles larger than the No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty *If too dry*, water must be added and if sticky, the specimen should be spread out *in a thin layer and allowed to lose some* moisture by evaporation Then the specimen *is rolled* out by hand on a smooth surface or between the palms into a thread about one-eight inch in diameter The thread is then folded and re-rolled repeatedly. *During this manipulation* the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles

The tougher the thread *near* the plastic limit and the stiffer the lump when it finally crumbles, the more potent is the colloidal clay fraction in the soil Weakness of the thread at the plastic *limit and quick loss* of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-*line*

Highly organic clays have a very weak and spongy feel at the plastic limit.

UNIFIED SOIL CLASSIFICATION SYSTEM
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE II-5-1

FUGRO NATIONAL, INC.

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Consistency	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

Consistency	Shear Strength (ksf)	Shear Strength (kn/m^2)	Field Guide
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25-0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50-1.00	24-48	Can be molded easily with fingers
Stiff	1.00-2.00	48-96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00-4.00	96-192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt

Trace - 5-12% (by dry weight)
Little - 13-20% (by dry weight)
Some - >20% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >30)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) or more.

I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, loss of drilling fluid in the boring, trench wall stability, and other conditions encountered during drilling and excavations.

J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Sieve Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass a 3-inch (76-mm) sieve and are retained on No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, within an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

Drilling Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

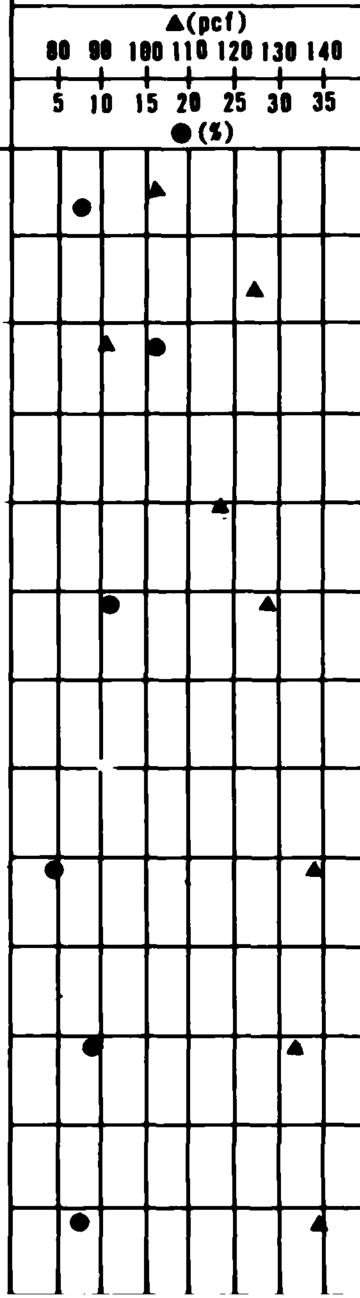
Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

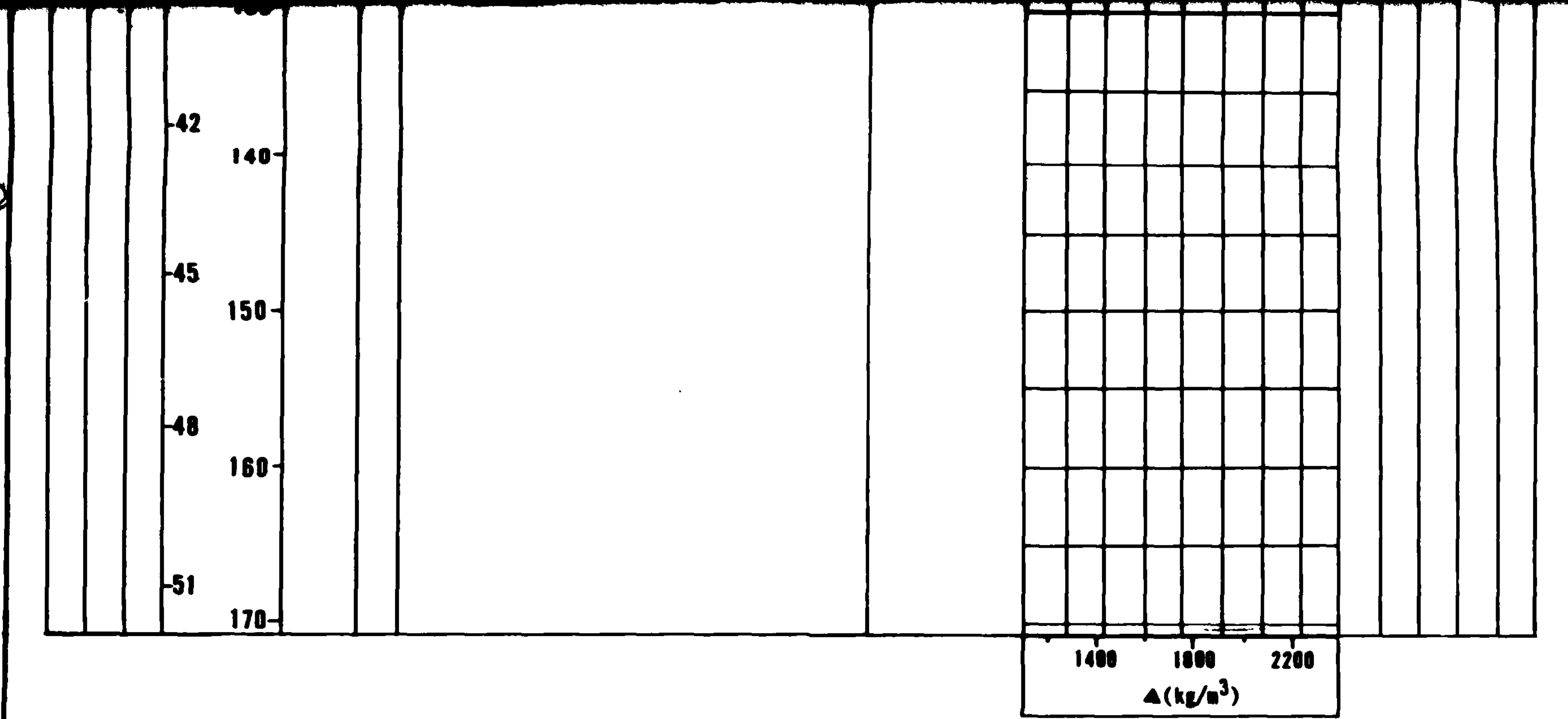
Trench Orientation - bearing of longitudinal trench centerline.

Depth (Feet)	Depth (Meters)	USCS	Soil Description	Remarks	GR	SA	FI	LL	PI
0–10	0–3	SM	SILTY SAND, brown, fine to coarse, poorly graded, loose to medium dense, angular to subrounded, calcareous, little to some nonplastic silt, little to some fine angular gravel		25	38	37		
10–15	3	MH	SANDY SILT, brown, stiff, medium plastic, calcareous, some fine to coarse angular sand, trace fine gravel	cementation	9	36	55	62	22
15–20	6	SP-SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, dense, angular to subangular, calcareous, some fine to coarse angular gravel, trace nonplastic silt	cementation	38	50	12		
20–30	6–9	SM							
30–50	9–15	GP-GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, very dense, angular, calcareous, some fine to coarse angular to subangular sand, trace to little nonplastic silt		50	41	9		
50–60	15–18	GM							
60–	18–		GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, angular to subangular, calcareous, some fine gravel, trace		42	43	15		

Sample Type	% Recovery	N Value
Sample	100	
Sample	100	
Sample	100	
Sample	100	
Sample	80	
Sample	100	
Sample	80	
Sample		
Sample	100	
Sample	40	
Sample	60	



Blow count	Elevation (m)	Depth (ft)	Symbol	Description	Tests
40		50	GM		
60	-18	60	SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, angular to subangular, calcareous, some fine gravel, trace to little nonplastic silt.	42 43 15
	-21	70			
	-24				
50		80	SP SM		
	-27				
100		90			
	-30	100		TOTAL DEPTH 101.0' (30.8m)	
	-33	110			
	-36	120			
	-39	130			
	-42				



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

● - MOISTURE CONTENT (ASTM: D-2216-71)

NR - NO RECOVERY

* - N VALUE > 100

† - TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 20 November 1979
DRILLING METHOD	: Rotary Wash'
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-1
PINE VALLEY, UTAH

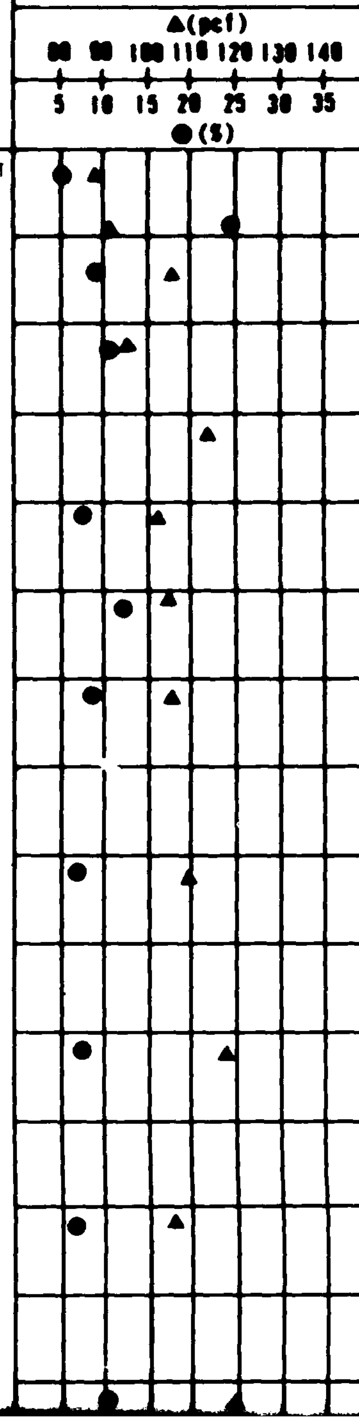
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-5-1

FUGRO NATIONAL, INC.

1 ?.

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	5 2 11 28 12	0	0		SM	Interbedded layers of GRAVELLY SAND and SILTY SAND GRAVELLY SAND (SM-SP, SM): brown, fine to coarse, poorly graded, medium dense to very dense, subrounded to rounded, calcareous, some fine gravel, little nonplastic silt SILTY SAND (SM): light gray to ..., fine to coarse, poorly graded, loose to ... dense, subrounded to rounded, calcareous, little to some nonplastic silt, trace to little fine gravel	Continuous SPT (0.0-10.5) sample interval not shown	0	80	20		
									1	53	46		
									23	64	13		
	67		3	10					4	63	33		
	53								[illegible]	65	35		NP
	100		6	20									
	100												
	100		9	30									
	100		12	40					1	78	21		
	100		15	50									
	100		18	60									
			21	70									



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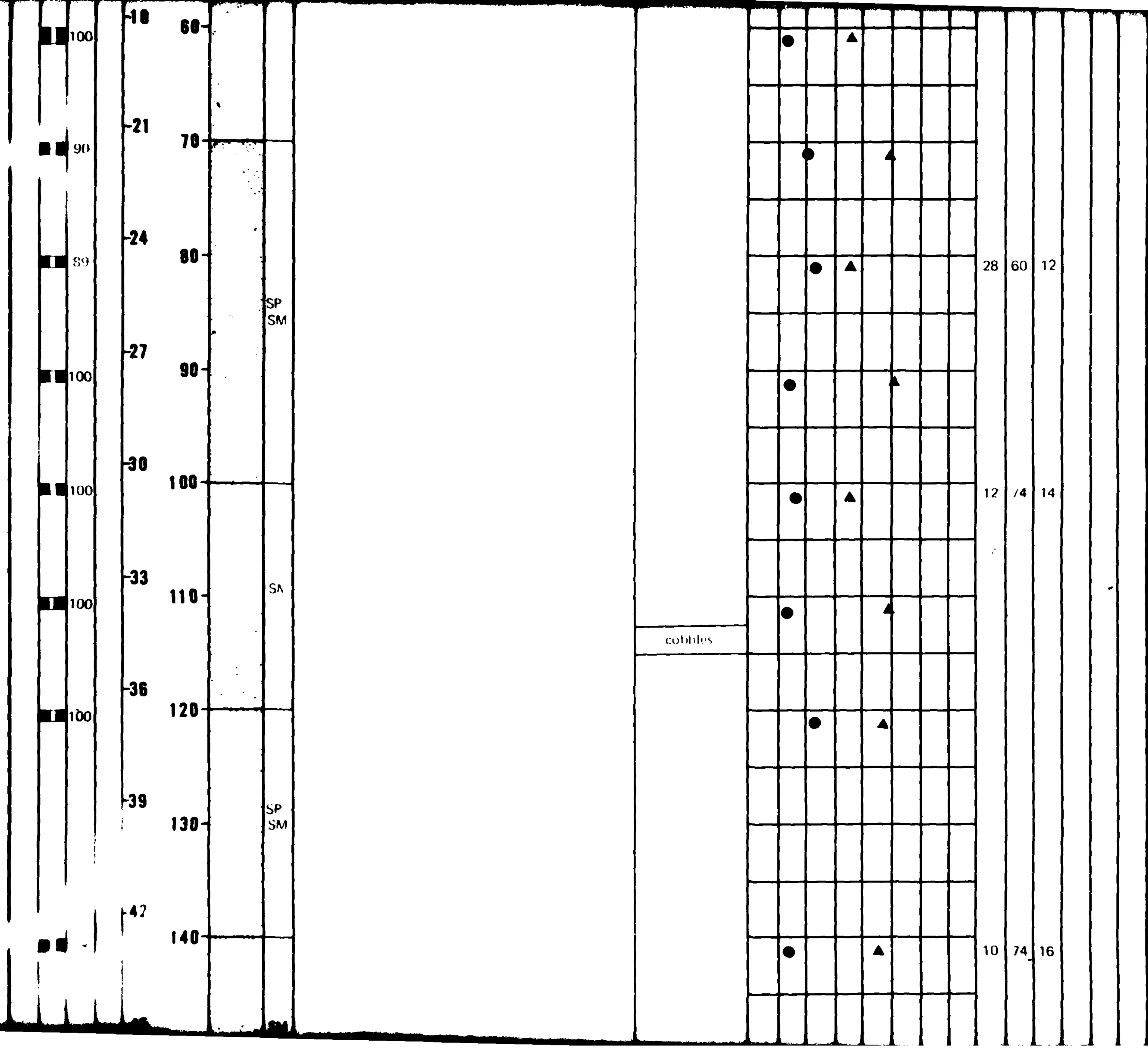
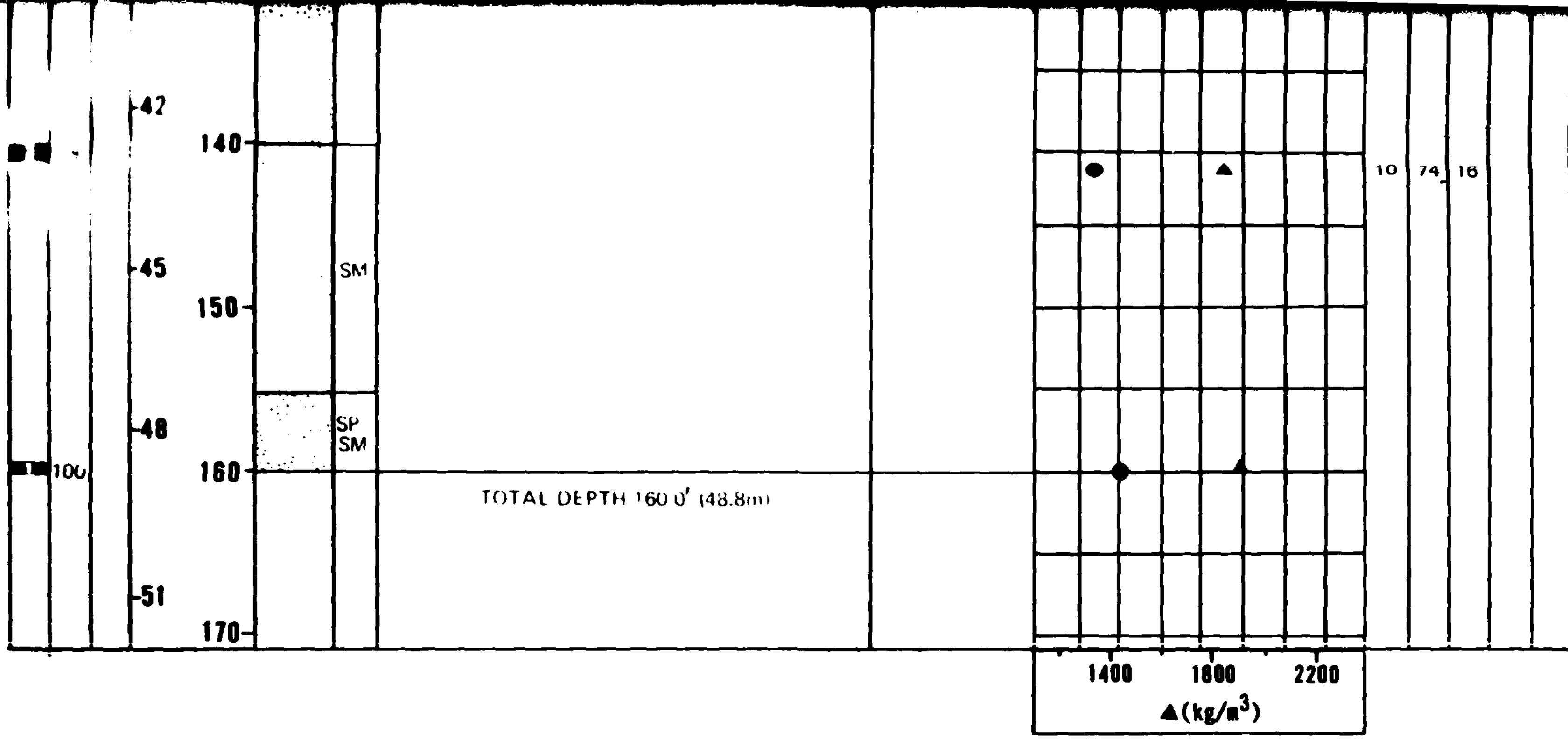


100
90
89
100
100
100
100
18
21
24
27
30
33
36
39
42
60
70
80
90
100
110
120
130
140
SP SM
SM
SP SM
cobbles
28 60 12
12 74 14
10 74 16



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N - STANDARD PENETRATION RESISTANCE

▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)

● - MOISTURE CONTENT (ASTM: D-2216-71)

NR - NO RECOVERY

* = N VALUE

† = TEST ... APPRO... LY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5275' 1608m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 13 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-2
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

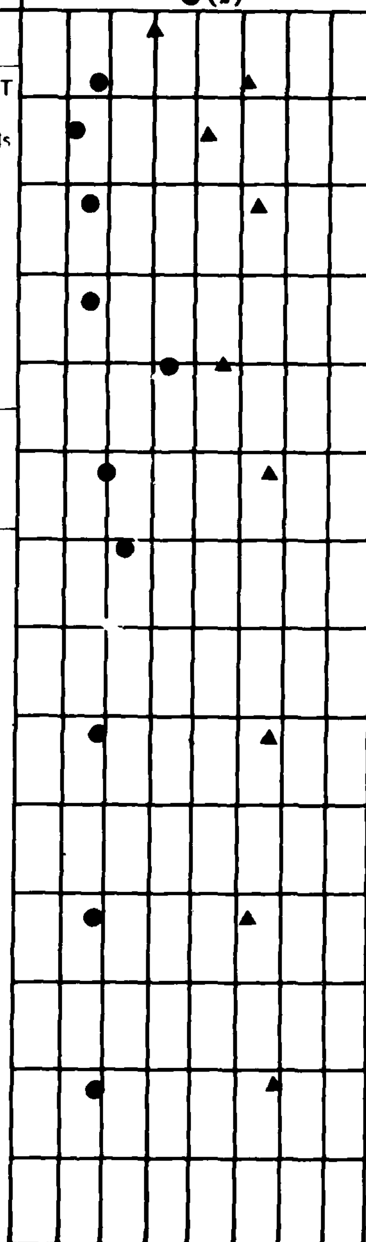
FIGURE II-5-2

FUGRO NATIONAL, INC.

13

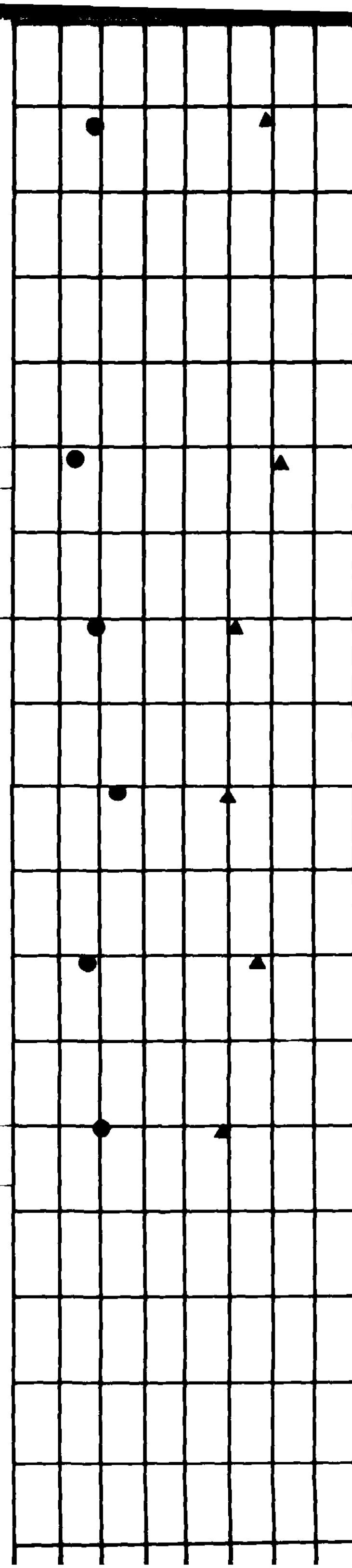
SAMPLE TYPE	% RECOVERY	† N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS
	100	18 *	0	0		SM	SILTY SAND, brown, fine to coarse, poorly graded, medium dense, subangular to subrounded, calcareous, some slightly plastic silt	cementation
	100					SW-SM	GRAVELLY SAND, brown, fine to coarse, well graded, dense, subangular to subrounded, calcareous, trace silt, clayey sand (19.0' - 22.0').	Continuous SPT (0.0'-3.0') sample intervals not shown
	100							
	80		3	10				
	100							
	100		6	20		SC		
	100					GP GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, very dense, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.	cobbles
	100		9	30		SP SM	GRAVELLY SAND, gray to brown, fine to coarse, poorly graded, very dense, subangular to rounded, calcareous, some fine to coarse gravel, trace to some nonplastic silt.	
	100		12	40				
	100		15	50				
	100		18	60				
			21					

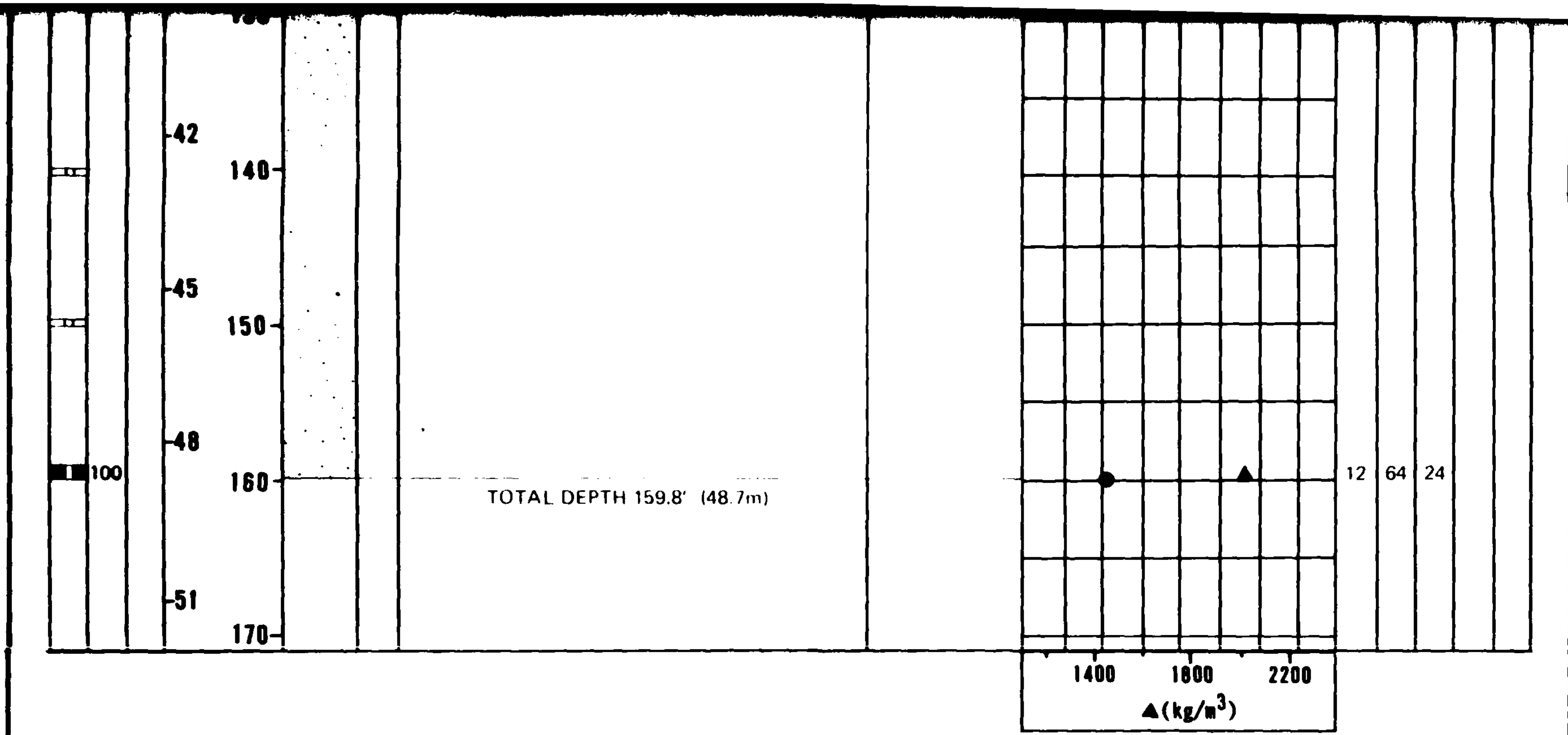
▲(pcf) 80 90 100 110 120 130 140
● (%) 5 10 15 20 25 30 35



SIEVE ANALYSIS GR	SA	FI	LL	PI
4	52	44		
13	78	9		
8	86	6		
34	56	10		
1	49	50	37	16
52	36	12		
42	49	9		

Elev.	Depth	Recovery	Class	Description	Remarks	Gradation		
-18	60	100						
-21	70	100						
-24	80	100	SM		cementation	25	51	24
					cobbles			
-27	90	100		SILTY SAND, gray to brown, fine to coarse, poorly graded, very dense, subangular to rounded, calcareous; little nonplastic silt, trace fine gravel.		8	79	13
-30	100	100						
-33	110	100				11	70	19
-36	120	100	SM		cementation	8	75	17
-39	130							
-42	140							





13

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N – STANDARD PENETRATION RESISTANCE
- ▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● – MOISTURE CONTENT (ASTM: D-2216-71)
- NR – NO RECOVERY
- * – N VALUE > 100
- † – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 6405' (1952m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 15 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-5
PINE VALLEY, UTAH

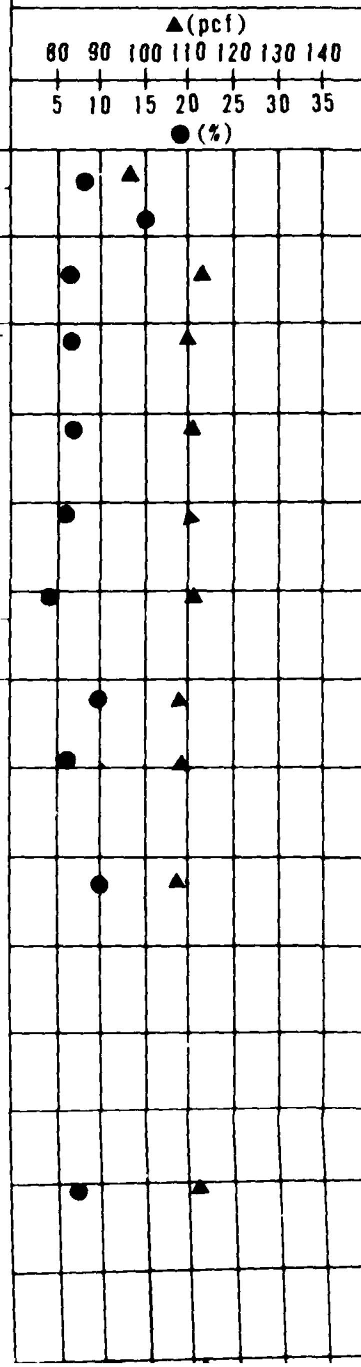
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-5-3

FUGRO NATIONAL, INC.

Depth (meters)	Depth (feet)	USCS	Soil Description	Remarks
0	0	SM	SILTY SAND, brown, fine to coarse, poorly graded, loose, subangular to subrounded, calcareous; some slightly plastic silt.	cementation
		SW-SM	GRAVELLY SAND and SAND, brown, fine to coarse, well graded, dense, subangular to subrounded, calcareous; some fine gravel, trace nonplastic silt.	cobbles; Continuous SPT (0.0'-10.5') sample intervals not shown
3, 6, 9	10, 20, 30	SM	SILTY SAND, brown, fine to coarse, poorly graded, dense, subangular to subrounded, calcareous, little nonplastic silt; trace fine gravel.	cobbles
9, 12, 15	30, 40, 50	SW-SM	SAND, brown, fine to coarse, well graded, dense to very dense, subangular to subrounded, calcareous; trace silt, none to trace fine gravel. sandy gravel (50.0' - 57.0').	
15	50	GW-GM		
18	60	SW-SM		

Sample	% Recovery	N Value	GR	SA	FI	LL	PI
1	100	5, 20	2	69	29		
2	100	16, 14	25	65	10		
3	100	15, 45, 48	3	89	8		
4	100						
5	100						
6	100		10	76	14		
7	100						
8	100		0	91	9		
9	80						
10	100						
11			53	39	8		
12	100						



AD-A112 849 FUGRO NATIONAL INC LONG BEACH CA F/G 8/7

MX SITING INVESTIGATION GEOTECHNICAL EVALUATION, VERIFICATION S--ETC(U)

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UNCLASSIFIED FN-TR-27-PI-2 NL

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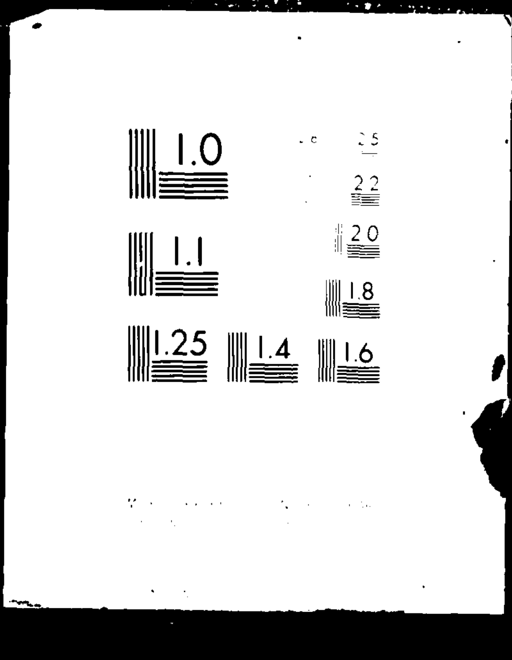

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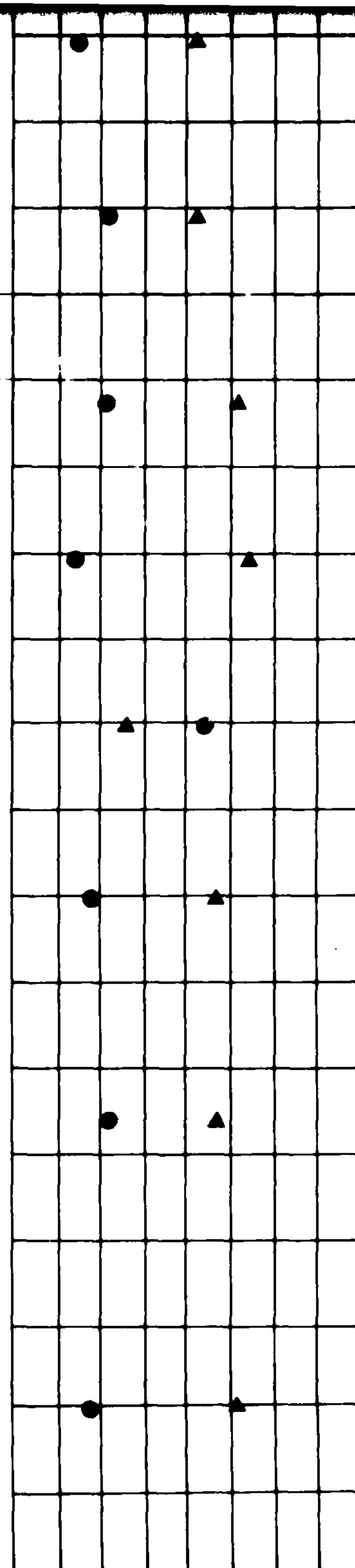
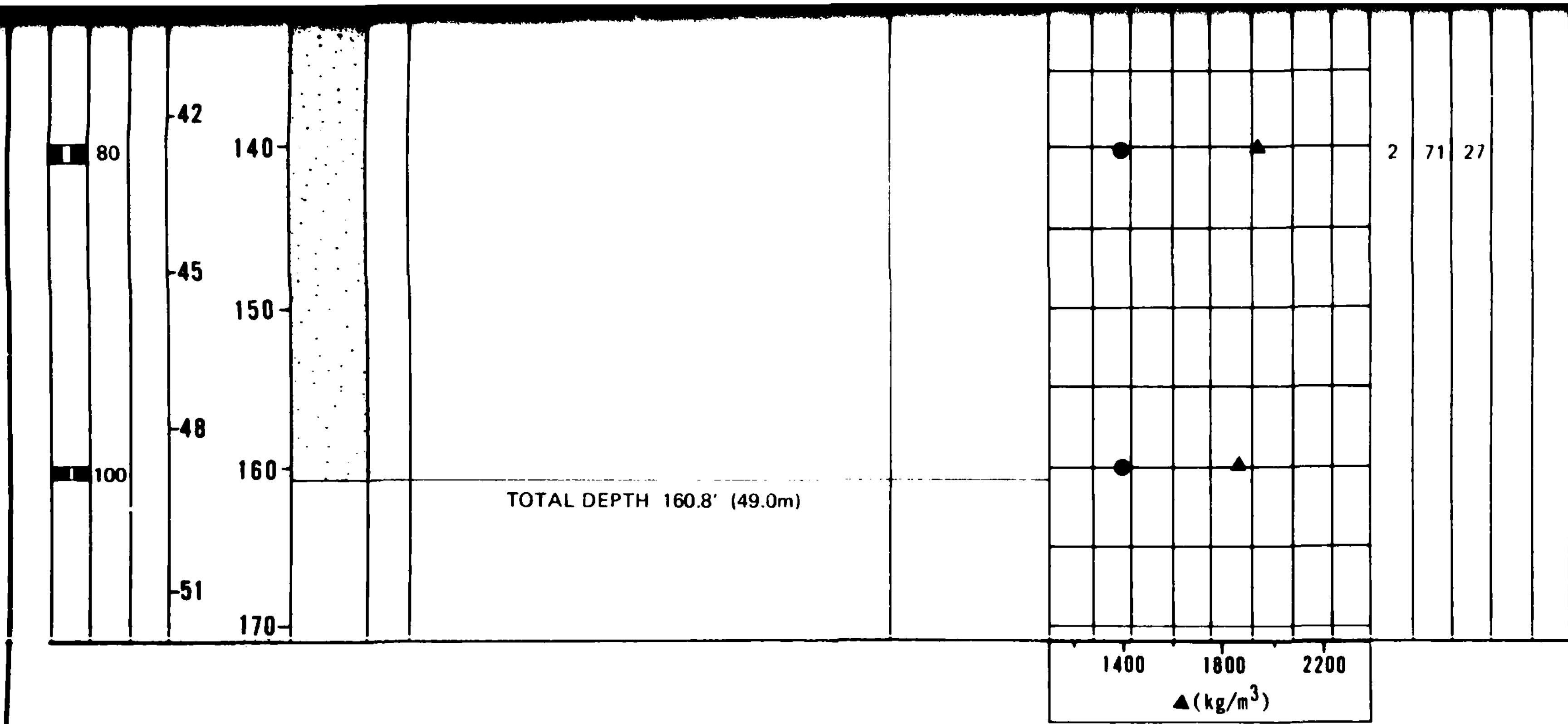
Recovery	Elevation	Depth	Symbol	Description	Remarks	Gradation
100		60	SW-SM			
100	-21	70	SW-SM		cobbles and boulders	
100	-24	80	SW-SM	GRAVELLY SAND, brown, fine to coarse, well graded, very dense, subangular to sub-rounded, calcareous; some fine to coarse gravel, trace silt.		35 54 11
100	-27	90	SW-SM			
100	-30	100	SM	SILTY SAND, brown, fine to coarse, poorly graded, very dense, subangular to subrounded, calcareous; some medium plastic silt.		3 62 35 58 17
100	-33	110	SM			
100	-36	120	SM			
	-39	130	SM			
80	-42	140	SM			2 71 27
	-45					





EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

* – N VALUE > 100

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5940' (1811m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 17 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-6
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE II-5-4

FUGRO NATIONAL, INC.

13

Depth (meters)	Depth (feet)	USCS	Soil Description	Remarks
0	0	SM	SILTY SAND, brown, fine to coarse, poorly graded, loose to medium dense, subrounded to rounded, calcareous, little nonplastic silt.	Continuous SPT (0.0'-10.5') sample intervals not shown
		SP-SM	SAND, brown, fine to coarse, poorly graded, medium dense, subrounded to rounded, calcareous	
3	10	SP		
		SP-SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, dense to very dense, subrounded to rounded, little to some fine gravel, trace to little silt	
6	20	SP		
9	30	SM		
12	40	SP		
15	50	SM		
18	60		SILTY SAND, light brown to brown, fine to coarse, poorly graded, very dense, subangular to rounded, calcareous, little slightly plastic silt.	

% Recovery	N Value
100	5
100	8
100	6
100	8
100	12
100	34
100	15
100	
90	
100	
100	
100	

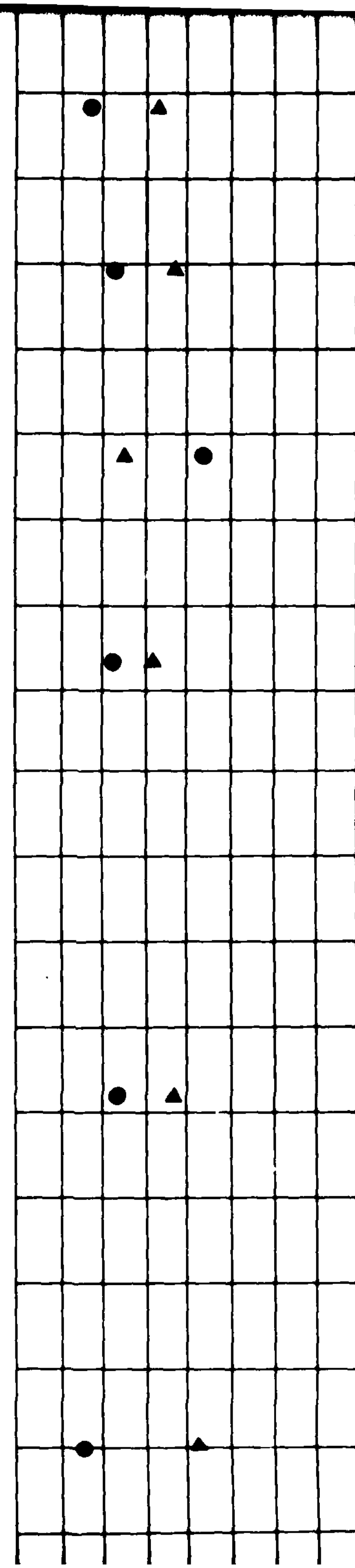
Sieve Analysis

GR	SA	FI	LL	PI
3	82	15		
3	83	14		
3	93	4		
14	82	4		
22	61	17		

▲(pcf) 80 90 100 110 120 130 140

● (%) 5 10 15 20 25 30 35

Recovery (%)	Elevation	Depth	Symbol	Description			
100	-18	60	SM	SILTY SAND, light brown to brown, fine to coarse, poorly graded, very dense, subangular to rounded, calcareous, little slightly plastic silt.			
88	-21	70			1	79	20
100	-24	80					
100	-27	90					
	-30	100	SM	GRAVELLY SAND, gray to brown, fine to coarse, poorly to well graded, very dense, subrounded to rounded; little to some fine to coarse gravel, trace to little silt.	30	57	13
	-33	110					
100	-36	120	SP				
	-39	130					
100	-42	140			18	72	10



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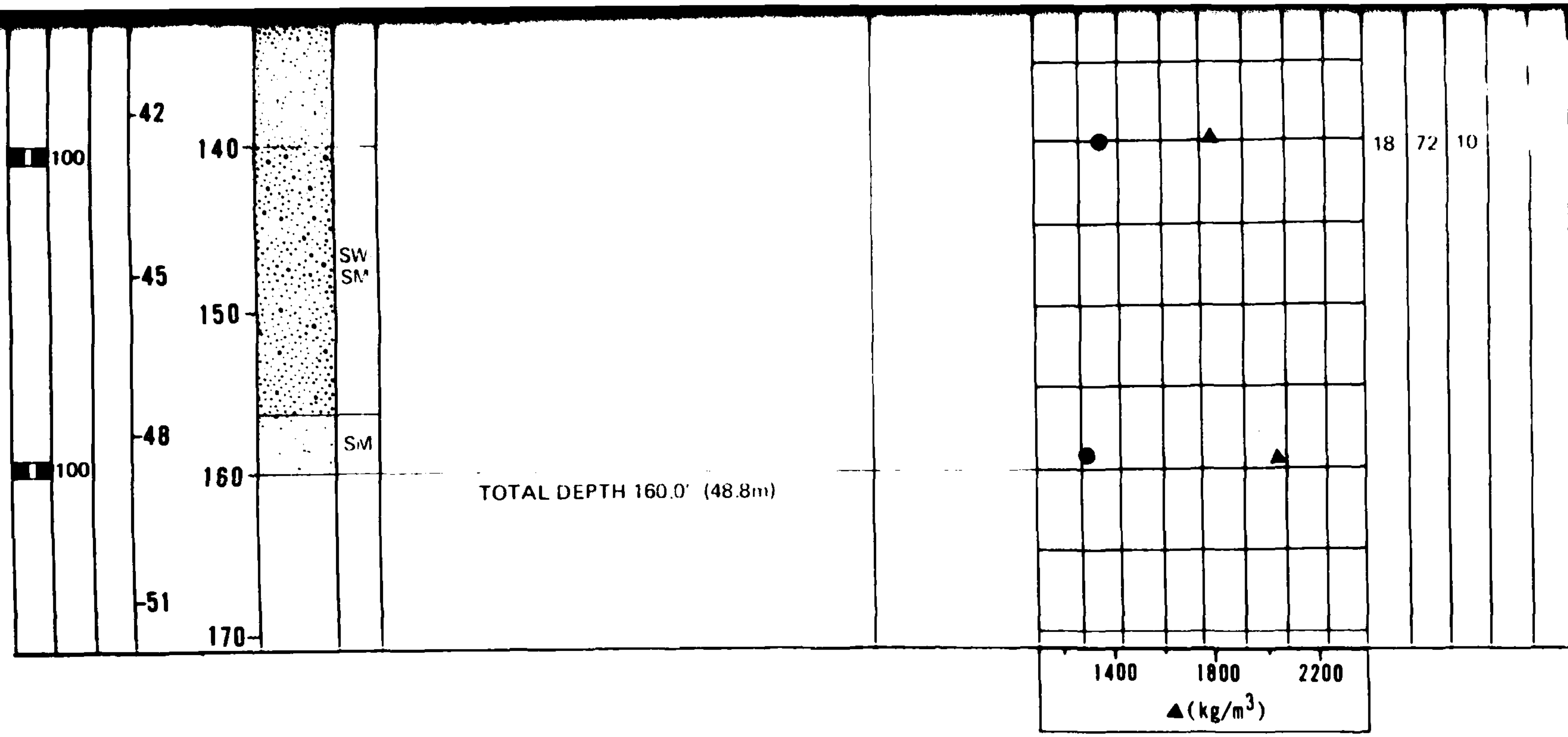


EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

* – N VALUE >100

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5630' (1716m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 18 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-7
PINE VALLEY, UTAH

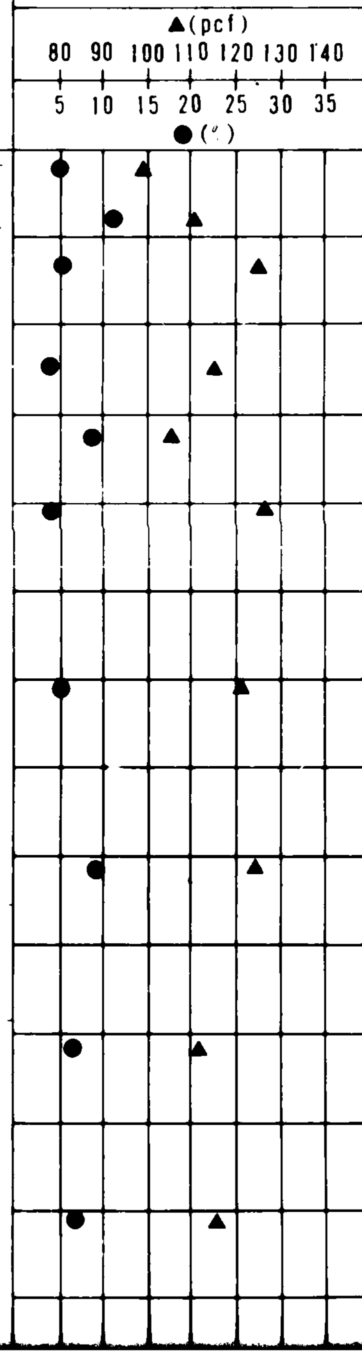
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

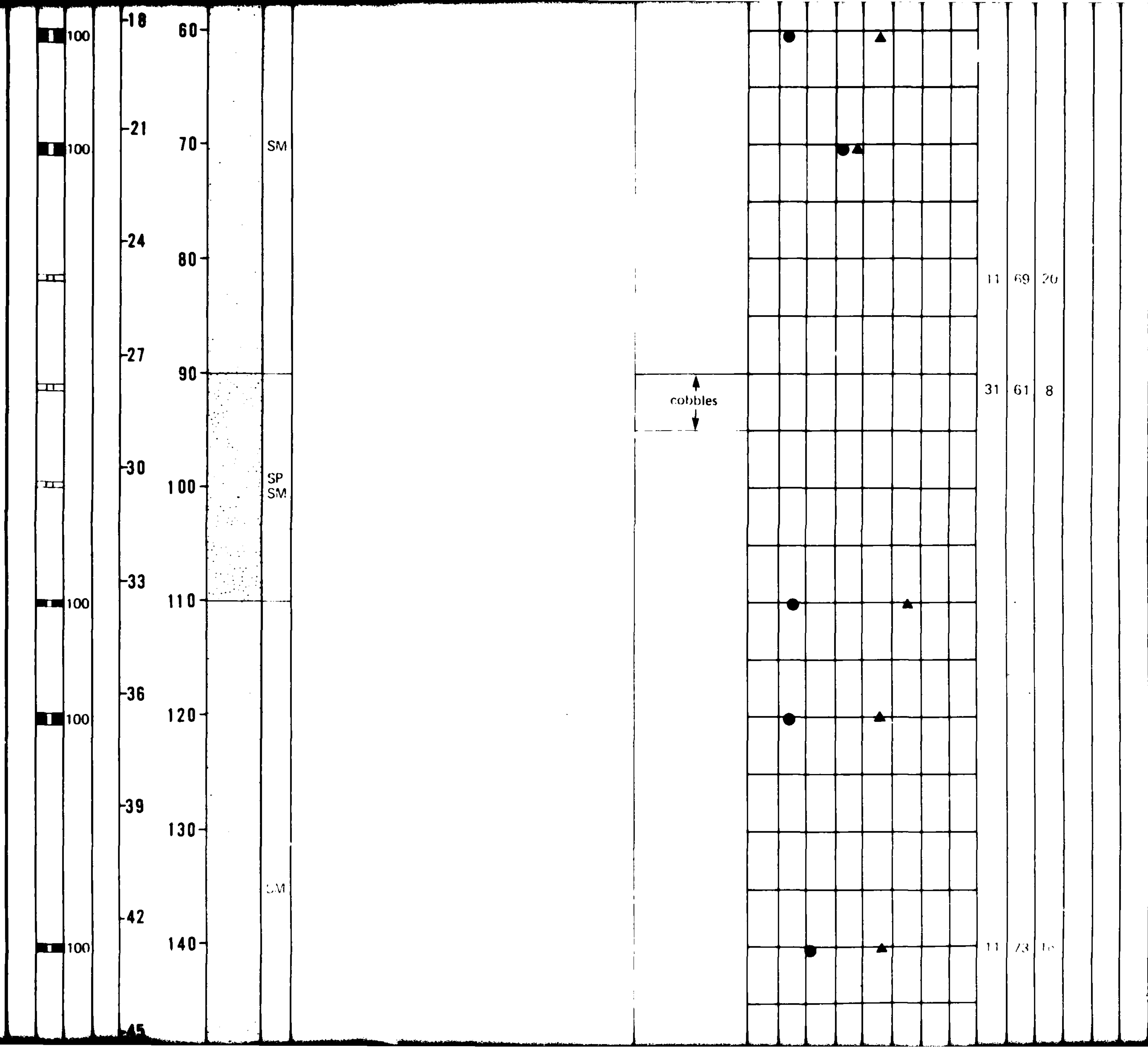
FIGURE
II-5-5

FUGRO NATIONAL, INC.

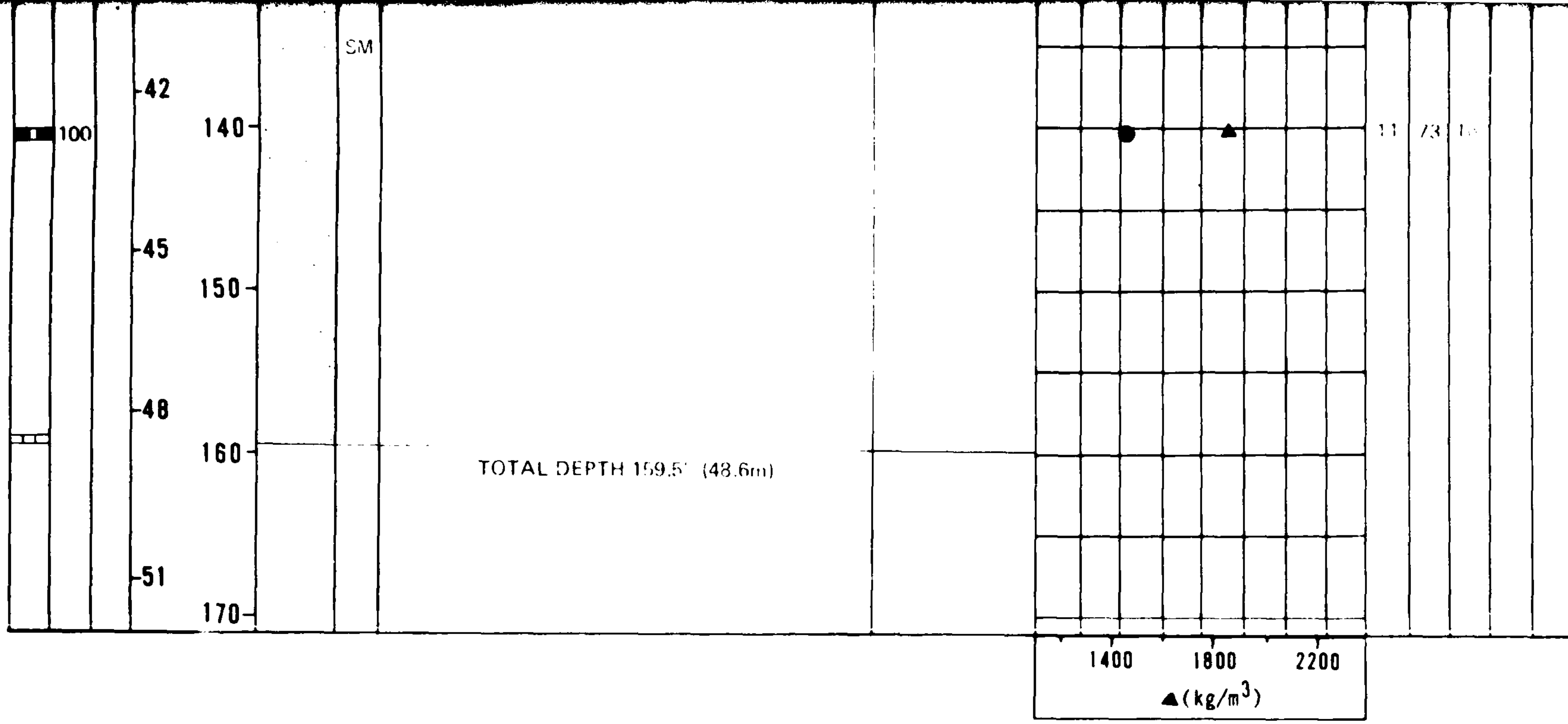
, 3

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	100	5	0	0		SM	Interbedded layers of GRAVELLY SAND and SILTY SAND. GRAVELLY SAND (SP -SM, SM): brown, fine to coarse, poorly graded, dense to very dense, subrounded to rounded, calcareous, little to some fine to coarse gravel, trace to little nonplastic silt. SILTY SAND (SM): brown, fine to coarse, poorly graded, loose to very dense, sub rounded to rounded, calcareous, little non plastic silt, none to trace fine gravel.	Continuous SPT (0.0'-8.5') sample interval not shown	0	87	13		
	100	17 34 58							10	74	16		
	100	28 *				SP-SM							
	NR		3	10									
	100					SM			15	72	13		
	100												
	100		6	20					32	56	12		
	NR												
	100		9	30		SP-SM							
	100		12	40				cobbles					
	100		15	50					10	72	18		
	100		18	60									





100
-18
60
-21
70
SM
-24
80
11 69 20
-27
90
cobbles
31 61 8
-30
100
SP
SM
-33
110
-36
120
-39
130
-42
140
11 73
-45



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

* – N VALUE > 100

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5350' (1631m)
SURFICIAL GEOLOGIC UNIT	: A3/A5y
DATE DRILLED	: 24 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI B-8
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE
II 5-6

FUGRO NATIONAL, INC.

13

SAMPLE TYPE / % RECOVERY	N VALUE †	DEPTH METERS	DEPTH FEET	LITHOLOGY / USCS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	6	0	0	SM	15	67	18		
100	6				43	36	21		
	74								
	*								
80				GM					
100		3	10		43	44	13		
				SM					
100		6	20	SP-SM					
70					34	55	11		
100		9	30	GM					
100		12	40	SM	27	59	14		
100		15	50		26	60	14		
100		18	60						

SOIL DESCRIPTION

SILTY SAND, light brown, fine to coarse, poorly graded, loose, subrounded to rounded, calcareous, little silt, little fine gravel.

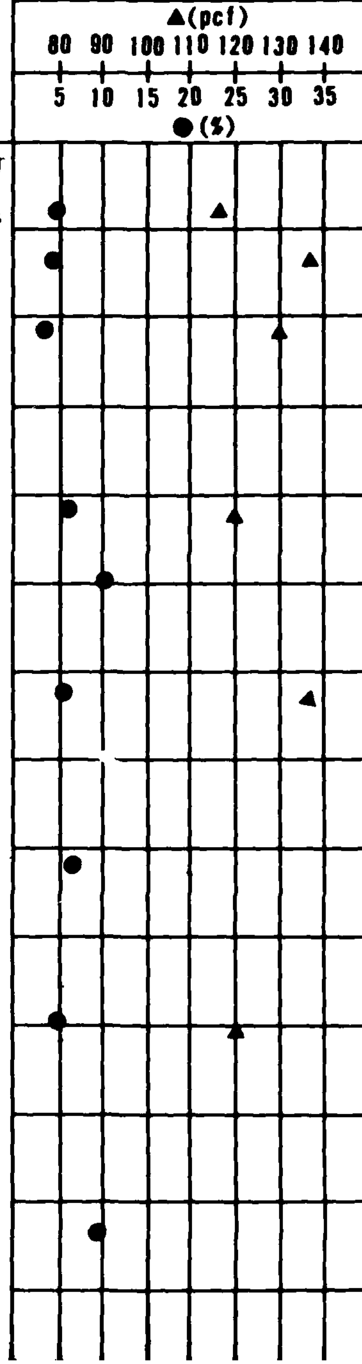
Interbedded layers of SANDY GRAVEL and GRAVELLY SAND:

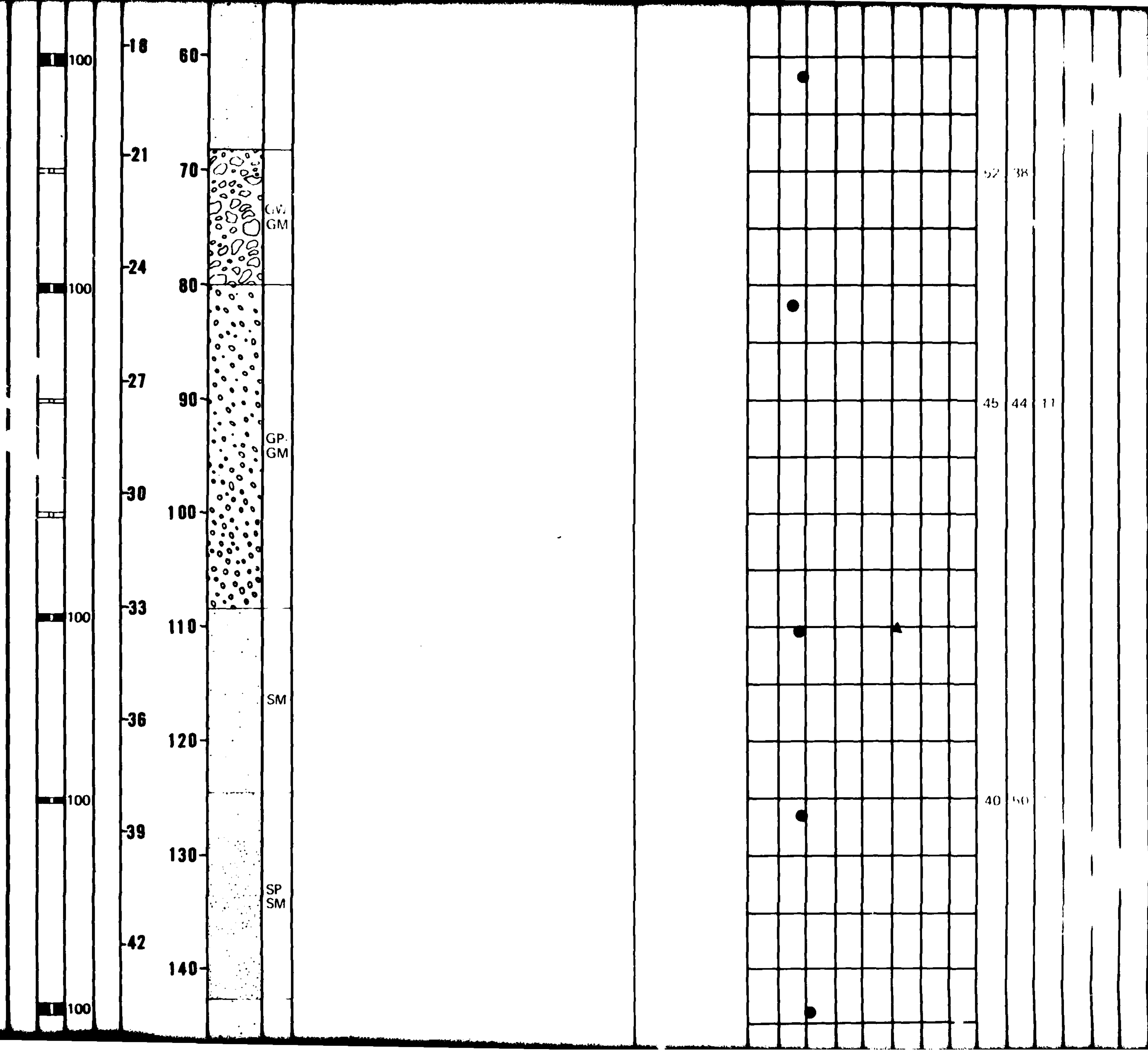
SANDY GRAVEL (GM, GW GM, GP GM): light brown to brown, fine to coarse, poorly to well graded, very dense, subrounded to rounded, calcareous, some fine to coarse sand, trace to some silt.

GRAVELLY SAND (SM, SP SM): brown, fine to coarse, poorly graded, very dense, subrounded to rounded, calcareous; some fine to coarse gravel, trace to little silt.

REMARKS

Continuous SPT (0.0' 4.5') sample intervals not shown




100
100
100
100
100
-18
-21
-24
-27
-30
-33
-36
-39
-42
60
70
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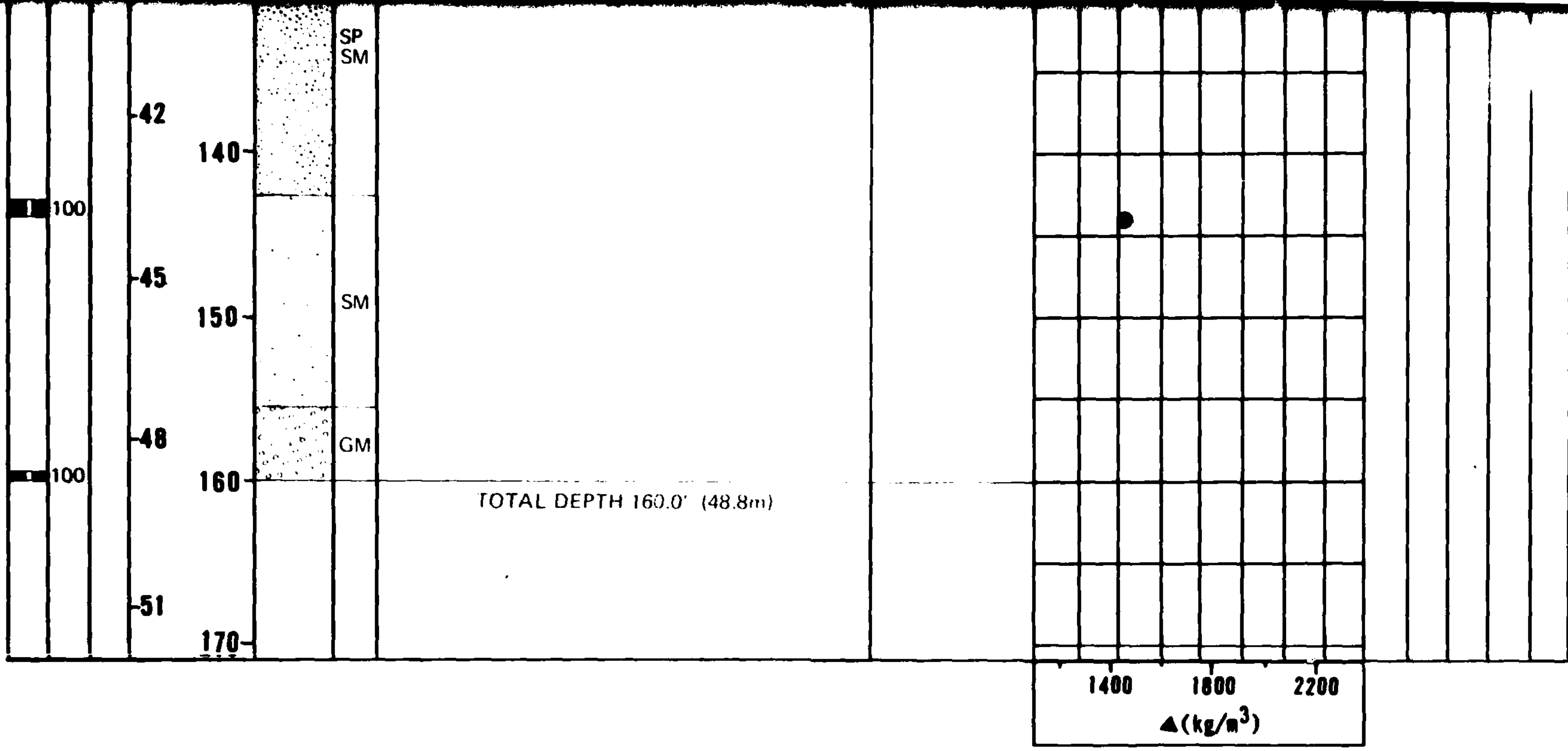
90
100
110
120
130
140
GW
GM
GP
GM
SM
SP
SM
52 38
45 44 11
40 50



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

* – N VALUE :·100

† – TEST LOCATION APPROXIMATE[illegible] FEET FRO[illegible] BORING

BORING DETAILS

ELEVATION	: 5200' (1585m)
SURFICIAL GEOLOGIC UNIT	: A5i
DATE DRILLED	: 25 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI B-9
PINE VALLEY, UTAH

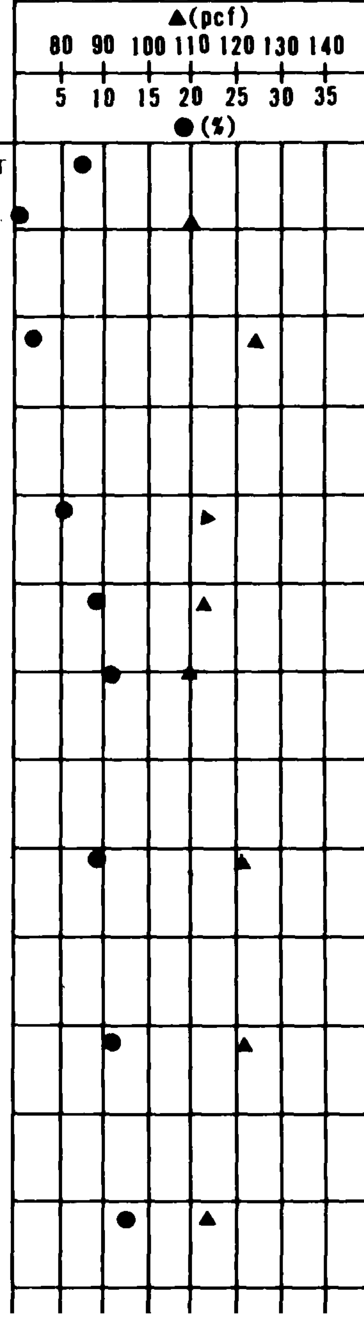
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · BMO

FIGURE
II-5 7

FUGRO NATIONAL, INC.

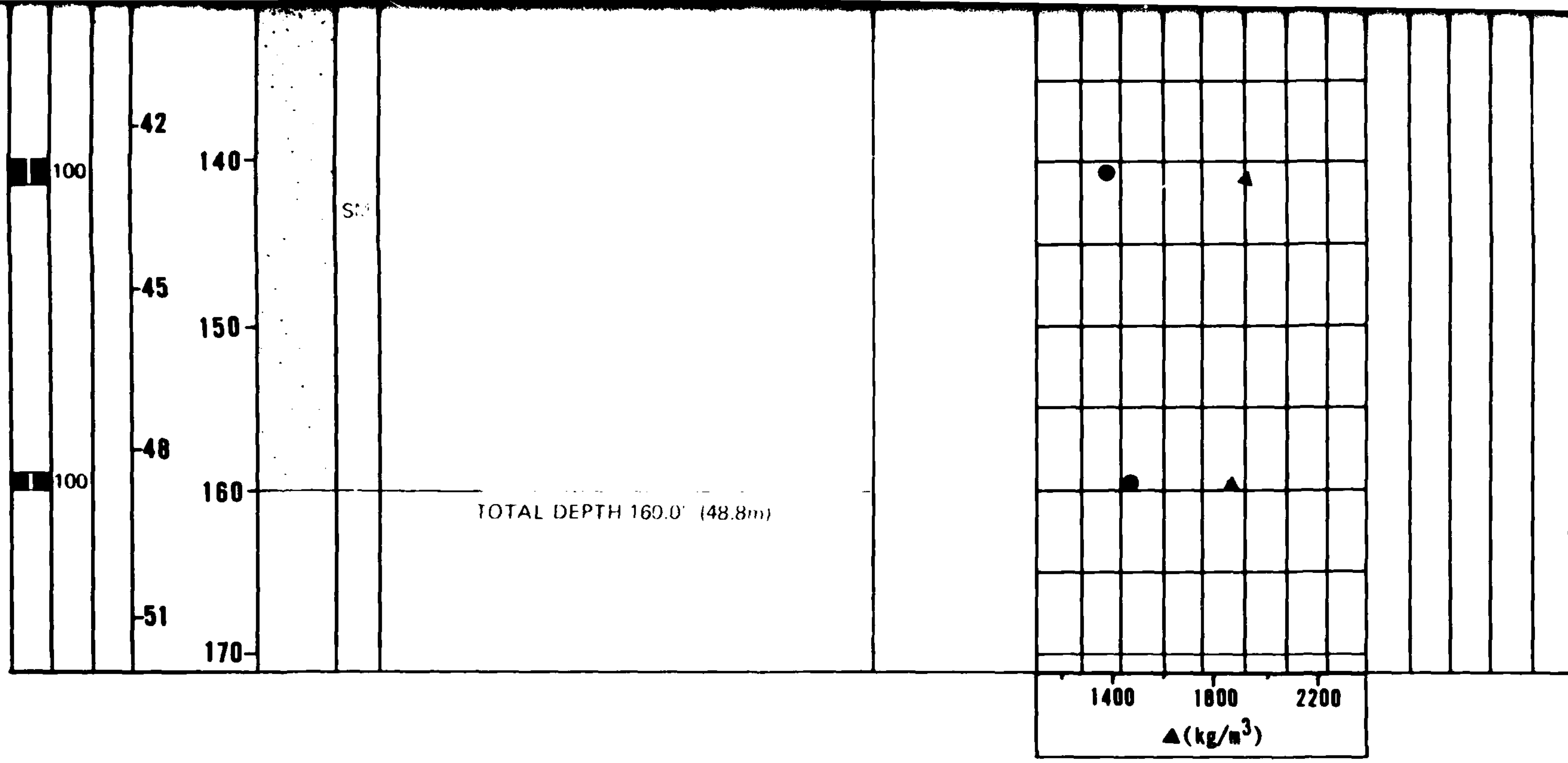
1.3

SAMPLE TYPE	% RECOVERY	N VALUE †	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	100	15	0	0		SM	SILTY SAND, brown, fine to coarse, poorly graded, medium dense, subrounded to rounded, calcareous, some slightly plastic silt	Continuous SPT (0.0'-10.0') sample interval not shown	3	61	36		
		11											
		14				SW SM			11	79	10		
		14							27	70	3		
		16				SP	GRAVELLY SAND, brown, fine to coarse, poorly to well graded, medium dense to very dense, subrounded to rounded, some fine to coarse gravel, sand (3.0'-5.0') and (20.0'-25.0').						
		29											
		20											
	100		3	10									
									47	49	4		
	100		6	20		SW SM			12	77	11		
	100					SM	SILTY SAND, brown, fine to coarse, poorly graded, dense, subrounded to rounded, calcareous, trace slightly plastic silt						
	100		9	30									
	100		12	40			GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, subrounded to rounded, calcareous, little fine gravel, little slightly plastic silt						
	80		15	50		SM			20	57	13		
	87		18	60			SILTY SAND, light brown to brown, fine to medium, poorly graded, dense to very dense, subrounded to rounded, calcareous, some slightly plastic silt.						



12

Depth	Elevation	Recovery	Soil type	Description	Gradation
60	-18	87	SM	SILTY SAND, light brown to brown, fine to medium, poorly graded, dense to very dense, subrounded to rounded, calcareous, some slightly plastic silt.	
70	-21	100			
80	-24	100			
90	-27	100			0 64 36
100	-30	67			
110	-33	100			0 68 32
120	-36	80	SW SM	GRAVELLY SAND, gray to brown, fine to coarse, poorly to well graded, dense to very dense, subrounded to rounded, calcareous little to some fine gravel, trace to little slightly plastic silt.	23 66 11
130	-39			cobbles	
140	-42	100	SM		



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

N – STANDARD PENETRATION RESISTANCE

▲ – DRY UNIT WEIGHT (ASTM: D-2937-71)

● – MOISTURE CONTENT (ASTM: D-2216-71)

NR – NO RECOVERY

* – N VALUE > 100

† – TEST LOCATION APPROXIMATELY 5 FEET FROM BORING

BORING DETAILS

ELEVATION	: 5220' (1591m)
SURFICIAL GEOLOGIC UNIT	: A1
DATE DRILLED	: 26 June 1980
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING PI-B-10
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-5-8

FUGRO NATIONAL, INC.

13,

6.0 TRENCH AND TEST PIT LOGS

See Section 5.0, "Boring Logs," for explanation.

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–4	SM	medium dense	SILTY SAND, brown to olive-gray, fine to coarse, poorly graded, dry to moist, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel; stage III caliche (4.0' - 6.0').	vertical walls stable	12	71	17		
4–6	SM	very dense							
6–9	SP-SM	dense	SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; trace fine to coarse gravel; trace nonplastic silt; stage I caliche.						
9–14	SP	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel.		38	59	3		
14			TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5480' (1670m)
DATE EXCAVATED : 29 MAY 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-1
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-1

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2.5		SM	medium dense	GRAVELLY SAND, light brown, fine to medium poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse gravel; little nonplastic silt.	vertical walls stable (0–9.0')	37	44	19		
	1	2.5–6		GP	very dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry to slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; stage II caliche.						
	2	6–9		SP	dense / very dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; stage I caliche (6.0' - 8.5'); stage IV caliche (8.5' - 9.0').		34	64	2		
	3	9				TOTAL DEPTH 9.0' (2.7m)	cementation at 9.0' exceeded capacity of Case 580C backhoe					

Depth scale: meters 0, 1, 2, 3, 4, 5, 6; feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION	: 5350' (1631m)
DATE EXCAVATED	: 30 MAY 1980
SURFICIAL GEOLOGIC UNIT	: A3/A5y
TRENCH LENGTH	: 13.0' (3.4m)
TRENCH ORIENTATION	: E–W

LOG OF TRENCH PI-T-2
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-2

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3		SM		SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; little fine gravel.	vertical walls stable (0–14)	15	69	16		
	1–4	3–14		SP-SM		GRAVELLY SAND, olive-gray, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; trace nonplastic silt; trace cobbles to 8" size; stage III caliche.						
		14				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5200' (1585m)
DATE EXCAVATED : 30 MAY 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-3
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-3

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2		GP–GM	medium dense	SANDY GRAVEL, light brown, fine to coarse poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; trace non-plastic silt; occasional cobbles and boulders to 19" size (0.0' - 14.0').	vertical walls stable	55	35	10		
	1	4–6		SP–SM	dense	GRAVELLY SAND, *light brown*, *fine to coarse*, poorly graded, dry, subangular to subrounded, calcareous; some fine gravel; trace nonplastic silt.		46	47	7		
	2–4	6–14		GP–GM	very dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little fine to coarse sand; trace non-plastic silt.		77	14	9		
	5–6	16–20				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION	: 5560' (1695m)
DATE EXCAVATED	: 30 MAY 1980
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T-4
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-4

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, brown, fine to medium, poorly graded, moist, subangular to subrounded, calcareous; some nonplastic silt.	vertical walls stable	0	69	31		
	1	2, 4										
	2	6, 8		SP	medium dense	GRAVELLY SAND, gray-brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; occasional cobbles to 5" size.	vertical walls unstable	38	59	3		
	3, 4	10, 12, 14		SM	dense	SILTY SAND, brown, fine to medium, poorly graded, dry, subangular to subrounded, calcareous; little nonplastic silt.	vertical walls stable					
	5, 6	16, 18, 20				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION	: 5275' (1608m)
DATE EXCAVATED	: 31 MAY 1980
SURFICIAL GEOLOGIC UNIT	: A5v
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T5
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-5

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2.5		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; little fine gravel.	vertical walls stable	14	71	15		
	1–4	2.5–14		SW	dense	GRAVELLY SAND, gray-brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; some fine gravel; occasional cobbles to 8" size; stage I caliche (3.0' - 7.0'); stage III caliche (7.0' - 14.0').		36	62	2		
		14				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5865' (1788m)
DATE EXCAVATED : 31 MAY 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E–W

LOG OF TRENCH PI-T-6
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-6

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; stage I caliche (1.0' - 3.0').	vertical walls stable	2	80	18		
	1	2 – 4		SP–SM	medium dense	SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; trace nonplastic silt; trace fine gravel; silty sand (3.0' - 4.0').						
	2 – 4	6 – 14										
	5 – 6	14 – 20				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5630' (1716m)
DATE EXCAVATED : 1 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-7
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-7

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

BULK SAMPLE	DEPTH (METERS)	DEPTH (FEET)	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt.	vertical walls stable (0'–14.0')	0	81	19		
	1	3		SP–SM	dense	SAND, light brown, fine to coarse, poorly graded, dry to slightly moist, subangular to subrounded, calcareous; trace nonplastic silt; occasional cobbles to 7" size (10.0'-14.0'); stage I-II caliche (3.0'-10.0').						
		14				TOTAL DEPTH 14.0' (4.3m)						

Depth scale: meters 0–6; feet 0–20.

TRENCH DETAILS

SURFACE ELEVATION : 5990' (1826m)
DATE EXCAVATED : 1 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-8
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-8

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	SILTY SAND, dark brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.	vertical walls stable	6	71	23		
	1	2										
	2	4, 6, 8		SW-SM	dense; very dense	SAND, brown, fine to coarse, well graded, moist, subangular to subrounded, calcareous; trace nonplastic silt; stage IV caliche (8.5' - 9.0').		4	87	9		
	3, 4, 5, 6	10, 12, 14, 16, 18, 20				TOTAL DEPTH 9.0' (2.7m)	cementation at 9.0' exceeded capacity of Case 580C backhoe					

TRENCH DETAILS

SURFACE ELEVATION : 6690' (2039m)
DATE EXCAVATED : 1 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 13.0' (4.0m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-9
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-9

FUGRO NATIONAL, INC.

Depth (feet)	USCS	Consistency	Soil Description	Remarks	Sieve Analysis GR	Sieve Analysis SA	Sieve Analysis FI	LL	PI
0 – 5.0	SM	dense (0 – 1.5); very dense	SILTY SAND, light brown to olive-gray, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; *little nonplastic silt; trace fine gravel*; stage II caliche (0.5' - 3.0'); stage IV caliche (3.0' - 5.0').	vertical walls stable					
5.0 – 14.0	SM	dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; *little fine gravel; little nonplastic silt*; occasional cobbles to 8" size (11.0' - 14.0'); stage II caliche (11.0' - 14.0').		14	73	13		
14.0			TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION	: 6280' (1914m)
DATE EXCAVATED	: 2 JUNE 1980
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T-10
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-10

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0 – 2		GM	dense / very dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; little non-plastic silt; trace cobbles and boulders to 18" size; stage II caliche (1.0' - 2.0').	vertical walls stable					
						TOTAL DEPTH 2.0' (0.6m)	cementation, cobbles and boulders at 2.0' exceeded capacity of Case 580C backhoe					

Depth scale: Meters 0, 1, 2, 3, 4, 5, 6; Feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION	: 6260' (1908m)
DATE EXCAVATED	: 2 JUNE 1980
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 10.0' (3.0m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T-11
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-11

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH (FEET)	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0–3.4		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some nonplastic silt.	vertical walls stable	2	73	25		
	3.4–4.9		SW	medium dense	GRAVELLY SAND, brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; some fine gravel.		28	69	3		
	4.9–7.4		SP	dense	SAND, brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; trace fine gravel; stage II caliche.						
	7.4–10.4		CL	stiff	SANDY CLAY, brown, slightly moist, medium plastic, calcareous; little fine to medium subangular to subrounded sand; stage I caliche.		0	20	80	38	18
	10.4–14		SW–SM	*dense*	GRAVELLY SAND, brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; little fine gravel; trace nonplastic silt; occasional cobbles to 6" *size; stage I caliche.*		15	79	6		
					TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5330' (1625m)
DATE EXCAVATED : 3 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-12
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-12

FUGRO NATIONAL, INC.

FN-TR-27-PI-?

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3.5		SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine gravel; little nonplastic silt; occasional cobbles to 6" size.	vertical walls stable	42	43	15		
		3.5–7		SP–SM	dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little fine to coarse gravel; trace nonplastic silt; stage I caliche (3.5' - 14.0').						
		7–11		GP	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little medium to coarse sand; little cobbles to 11" size.		81	17	2		
		11–14		SW–SM	dense	GRAVELLY SAND, light brown, fine to coarse, well graded, slightly moist, subangular to subrounded, calcareous; some fine gravel; trace nonplastic silt; trace cobbles to 8" size.		38	53	9		
		14				TOTAL DEPTH 14.0' (4.3m)						

TRENCH DETAILS

SURFACE ELEVATION : 5850' (1783m)
DATE EXCAVATED : 3 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-13
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-13

FUGRO NATIONAL, INC.

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USAF–37

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt.	vertical walls stable	1	73	26		
	1–4	2–14		SP	medium dense	GRAVELLY SAND, dark brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; little to some fine to coarse gravel.		14	85	1		
								42	57	1		
		14				TOTAL DEPTH 14.0' (4.3m)						

Depth scale: meters 0, 1, 2, 3, 4, 5, 6; feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION : 5220' (1591m)
DATE EXCAVATED : 4 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A1
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-14
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-14

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense / very dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine gravel; little nonplastic silt; occasional cobbles to 6" size; stage III caliche (0.5' - 2.5'); stage IV caliche (2.5' - 3.0').	vertical walls stable	33	48	19		
	1	2, 4				TOTAL DEPTH 3.0' (0.9m)	cementation at 3.0' exceeded capacity of Case 580C backhoe					
	2	6, 8										
	3	10, 12										
	4	14										
	5	16, 18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 6110' (1862m)
DATE EXCAVATED : 6 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 10.0' (3.0m)
TRENCH ORIENTATION : N–S

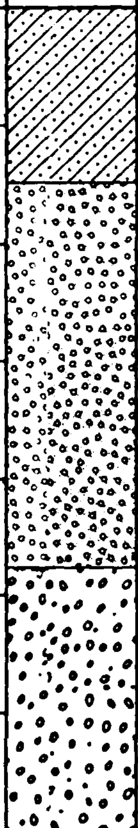
LOG OF TRENCH PI-T-15
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-15

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC	dense	CLAYEY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some slightly plastic clay; some fine to coarse gravel; trace cobbles to 10" size.	vertical walls stable (0–14 ft)	24	33	43	32	14
	1	4		GM	dense	SANDY GRAVEL, brown, fine, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; little non-plastic silt; some cobbles and boulders to 18" size; stage I-II caliche.		44	43	13		
	3	10		GP–GM	dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; trace non-plastic silt; trace cobbles to 8" size.		67	23	10		
		14				TOTAL DEPTH 14.0' (4.3m)						



TRENCH DETAILS

SURFACE ELEVATION	: 6640' (1963m)
DATE EXCAVATED	: 10 JUNE 1980
SURFICIAL GEOLOGIC UNIT	: A5i
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T-16
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-16

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0, 1	0, 2		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some nonplastic silt; little fine subangular gravel; stage II caliche (1.0'-3.0').	vertical walls stable	13	60	27		
		4		GP		SANDY GRAVEL, dark brown, fine to coarse, poorly graded, moist, subangular , calcareous; some fine to coarse subangular to subrounded sand; trace nonplastic silt (5.5' - 11.0'); some cobbles and boulders to 15" size.		51	47	2		
	2, 3	6, 8, 10		GP–GM	dense			74	21	5		
	4	12, 14		SP	dense	GRAVELLY SAND, dark brown, fine to coarse, poorly graded, moist, subangular; calcareous; some fine to coarse gravel; some cobbles to 8" size.						
	5, 6	16, 18, 20				TOTAL DEPTH 14.0' (4,3m)						

TRENCH DETAILS

SURFACE ELEVATION	: 6600' (2012m)
DATE EXCAVATED	: 12 JUNE 1980
SURFICIAL GEOLOGIC UNIT	: A50
TRENCH LENGTH	: 14.0' (4.3m)
TRENCH ORIENTATION	: N–S

LOG OF TRENCH PI-T-17
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-17

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0	0–4		SM	dense / very dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse subangular gravel; little nonplastic silt; trace cobbles to 6" size; stage III-IV caliche (1.0' - 4.0').	vertical walls stable	36	46	18		
		4				TOTAL DEPTH 4.0' (1.2m)	cementation at 4.0' exceeded capacity of Case 580C backhoe					

Depth scale: meters 0, 1, 2, 3, 4, 5, 6; feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION : 6405' (1952m)
DATE EXCAVATED : 13 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 18.0' (5.5m)
TRENCH ORIENTATION : N–S

LOG OF TRENCH PI-T-18
PINE VALLEY, UTAH

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FIGURE II-6-18

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		CL	firm	SANDY CLAY, dark brown, moist, medium plastic, calcareous; some fine to coarse subangular to subrounded sand.	vertical walls stable	4	36	60	39	17
	3	10		GM	very dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse subangular to subrounded sand; little nonplastic silt; little cobbles to 10" size.		43	40	17		
		12				TOTAL DEPTH 12.0' (3.6m)	excavation capacity of Case 580C exceeded at 12.0'					

Depth scale: meters 0, 1, 2, 3, 4, 5, 6; feet 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

TRENCH DETAILS

SURFACE ELEVATION : 6500' (1981m)
DATE EXCAVATED : 13 JUNE 1980
SURFICIAL GEOLOGIC UNIT : A50
TRENCH LENGTH : 14.0' (4.3m)
TRENCH ORIENTATION : E–W

LOG OF TRENCH PI-T-19
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-6-19

FUGRO NATIONAL, INC.

FN-TR-27-PI-II

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0–1.5	0–5		GM	medium dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; little nonplastic silt.	vertical walls stable	42	42	16		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5840' (1780m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-1

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
		0–2		GM	medium dense	Interbedded layers of SANDY GRAVEL and SILTY SAND: SANDY GRAVEL (GM); brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse sand; little nonplastic silt; stage II caliche (1.0'-2.0') SILTY SAND (SM); brown, fine to medium, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt.	vertical walls stable	48	37	15		
		2–4		SM								
		4–5		GM								
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-2

LOGS OF TEST PITS PI-P-1 AND PI-P-2
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-20

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1.5	0 – 5		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel.	vertical walls stable	7	73	20		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5760' (1756m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-3

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1.5	0 – 5		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel.	vertical walls stable	9	77	14		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5255' (1602m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-4

LOGS OF TEST PITS PI-P-3 AND PI-P-4
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-21

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3		ML	stiff	SANDY SILT, light brown, moist, slightly plastic, calcareous; little fine to medium subrounded sand; stage I caliche.	vertical walls stable	0	17	83	39	10
	1	3–5		SM	dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; little nonplastic silt; stage II caliche.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5185' (1580m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT PI-P-5

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–3		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt	vertical walls unstable	3	79	18		
	1	3–5		SP	loose	SAND, dark brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; trace fine gravel.		6	93	1		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5170' (1576m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT PI-P-6

LOGS OF TEST PITS PI-P-5 AND PI-P-6
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-22

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0–1.5	0–5		SP	medium dense	GRAVELLY SAND, gray-brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine gravel.	vertical walls stable	27	69	4		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5140' (1567m)
SURFICIAL GEOLOGIC UNIT: A4o

LOG OF TEST PIT PI-P-7

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
	0	0–2.5		SP-SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little fine gravel; trace nonplastic silt.	vertical walls stable	17	71	12		
	1	2.5–5		SP	medium dense	SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; trace fine gravel.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5255' (1602m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-8

LOGS OF TEST PITS PI-P-7 AND PI-P-8
PINE VAL[illegible]. UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-23

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–2.5		SM	medium dense	GRAVELLY SAND light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine gravel; little nonplastic silt.	vertical walls stable	21	66	13		
	1	2.5–5		GW	dense	SANDY GRAVEL, gray-brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; some fine to coarse sand; stage I caliche.		51	47	2		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5430' (1655m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT PI-P-9

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0–3		SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse gravel; little nonplastic silt; occasional cobbles to 6" size.	vertical walls stable	32	53	15		
	1	3–5		SP	dense	GRAVELLY SAND, gray-brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; stage I caliche.		27	72	1		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5675' (1730m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-10

LOGS OF TEST PITS PI-P-9 AND PI-P-10
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-24

FUGRO NATIONAL, INC.

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–3.5	SP	medium dense	GRAVELLY SAND, dark brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded; some fine to coarse gravel; trace cobbles to 6" size; stage I caliche (1.0'-3.5').	vertical walls stable					
3.5–5.0	SM	very dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt, stage II caliche.						
5.0			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5360' (1634m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-11

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–3.0	SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry to moist, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel; stage II caliche (3.0'-5.0')	vertical walls stable	7	79	14		
3.0–5.0		dense							
5.0			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5530' (1686m)
SURFICIAL GEOLOGIC UNIT: A5y/A5i

LOG OF TEST PIT PI-P-12

LOGS OF TEST PITS PI-P-11 AND PI-P-12
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - [illegible]

FIGURE II-6-25

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; stage I caliche (1.5'-3.0').	vertical walls stable					
	1	3		SW-SM	medium dense	SAND, gray-brown, fine to coarse, well graded, slightly moist, subangular to subrounded, calcareous; trace nonplastic silt.		3	89	8		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5740' (1750m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-13

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, brown, fine to medium, poorly graded, moist, subangular to subrounded, calcareous; some slightly plastic silt.	vertical walls stable	0	71	29		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6320' (1926m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-14

LOGS OF TEST PITS PI-P-13 AND PI-P-14
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-26

FUGRO NATIONAL, INC.

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–4	SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel; stage I caliche (2.0'-4.0').	vertical walls stable					
4–5	SP	medium dense	SAND, gray-brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; trace fine gravel.		12	86	2		
5			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5820' (1774m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-15

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–4	SM	dense	SILTY SAND, brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; little nonplastic silt; trace fine gravel.	vertical walls stable	8	73	19		
4–5	SW-SM	dense	SAND, brown, fine to coarse, well graded, moist, subangular to subrounded, calcareous; trace nonplastic silt.		4	89	7		
5			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6060' (1847m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-16

LOGS OF TEST PITS PI-P-15 AND PI-P-16
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-27

FUGRO NATIONAL, INC.

LOG OF TEST PIT PI-P-17

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–5	GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; trace cobbles and boulders to 18" size.	vertical walls stable	54	33	13		
5			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5900' (1798m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-18

Depth (feet)	USCS	Consistency	Soil Description	Remarks	GR	SA	FI	LL	PI
0–3.3	SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some slightly plastic silt; trace fine gravel.	vertical walls stable	9	44	47		
3.3–5	SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine gravel; trace nonplastic silt.	vertical walls stable	26	64	10		
5			TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5295' (1614m)
SURFICIAL GEOLOGIC UNIT: A1

LOGS OF TEST PITS PI-P-17 AND PI-P-18
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-28

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1.5	0 – 5		GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, moist, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; occasional cobbles to 6" size.	vertical walls stable	50	34	16		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-19

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
		0 – 4		CL	stiff	SILTY CLAY, light brown, slightly moist, slightly plastic, calcareous; trace fine subangular to subrounded sand.	vertical walls stable	0	7	93	28	8
		4 – 5		SM	dense	SILTY SAND, light brown, fine to medium, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt.		1	77	22		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A5i/A1

LOG OF TEST PIT PI-P-20

LOGS OF TEST PITS PI-P-19 AND PI-P-20
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-29

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; little cobbles to 10" size; stage III caliche (1.0'-5.0').	vertical walls stable	46	41	13		
		1			very dense							
		2										
		3										
	1											
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6250' (1905m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-21

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt; some fine gravel; stage II-III caliche (0.5'-5.0').	vertical walls stable	23	54	23		
		1										
		2										
		3										
	1											
		4		SW-SM	dense	SAND, brown, fine to coarse, well graded, dry, subangular to subrounded, calcareous; trace nonplastic silt.		1	94	5		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6205' (1891m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-22

LOGS OF TEST PITS PI-P-21 AND PI-P-22
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-30

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1	0 – 5		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some slightly plastic silt; stage II caliche (1.0'-5.0').	vertical walls stable					
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6290' (1917m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-23

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0 – 1	0 – 5		SM	dense (0'-1.0'); very dense (1.0'-5.0')	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; some nonplastic silt; little fine gravel; trace cobbles to 8" size; stage III-IV caliche (1.0'-5.0').	vertical walls stable	20	51	29		
						TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6385' (1946m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-24

LOGS OF TEST PITS PI-P-23 AND PI-P-24
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-31

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0–4		SM	dense / very dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some nonplastic silt; some fine to coarse subangular to subrounded gravel; trace cobbles to 8" size; stage III-IV caliche (0.5'-4.0').	vertical walls stable					
	1	4–5		SP-SM	dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, dry, subangular to subrounded, calcareous; some fine to coarse gravel; trace nonplastic silt; trace cobbles to 8" size; stage II caliche.		47	48	5		
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6215' (1894m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT PI-P-25

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	GR	SA	FI	LL	PI
	0	0										
		1										
		2										
		3										
	1	4										
		5										

SURFACE ELEVATION:
SURFICIAL GEOLOGIC UNIT:

LOG OF TEST PIT PI-P-25
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-6-32

FUGRO NATIONAL, INC.

7.0 SURIFCIAL SAMPLE LOGS

Explanation: Finalized logs of the surficial samples are presented in this section. Explanations of the column headings on the logs follow.

A. Designations - Surficial samples are identified as follows:

PI-CS-1
PI - abbreviation for the valley (e.g., PI-Pine)
CS - abbreviation for surficial sample
1 - number of activity

B. Ground-Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table II-5-1 of Section 5.0, "Boring Logs," for details of USCS.

F. Soil Description - Soil is described based on field visual descriptions and/or laboratory test results. See Section 5.0, "Boring Logs," for procedures of soil description.

G. Sieve Analysis, LL and PI - These are from results of laboratory tests. See Section 5.0, "Boring Logs," for explanation.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SIEVE ANALYSIS SA	SIEVE ANALYSIS FI	LL	PI
PI-CS-2	5620 (1713)	A5i	0.0 - 2.0 (0.0 - 0.6)	GP-GM	SANDY GRAVEL, white to brown, fine to coarse, poorly graded, angular to subangular, calcareous; some fine to coarse sand; trace nonplastic silt; stage II caliche (1.0'-2.0').					
PI-CS-4	5620 (1713)	A3d	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, calcareous; some nonplastic silt; trace fine gravel.	8	64	28		
PI-CS-7	5370 (1637)	A5i	0.0 - 2.0 (0.0 - 0.6)	GW-GM	SANDY GRAVEL, light brown, fine to coarse, well graded, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.	50	39	11		
PI-CS-9	5170 (1576)	A4o	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to medium, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.	0	79	21		
PI-CS-10	5600 (1707)	A3/A5y	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.					
PI-CS-12	5230 (1594)	A3	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, poorly graded, subangular to subrounded, calcareous; little nonplastic silt.	0	85	15		
PI-CS-14	5085 (1550)	A4o	0.0 - 2.0 (0.0 - 0.6)	SC	CLAYEY SAND, light brown, fine to medium, poorly graded, subangular to subrounded, calcareous; some medium plastic clay.	0	53	47	36	18
PI-CS-17	6050 (1844)	A5i	0.0 - 2.0 (0.0 - 0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; trace cobbles to 10" size; stage II caliche (1.0'-2.0').					
PI-CS-20	5735 (1748)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; stage I caliche (1.5'-2.0').	1	75	24		
PI-CS-22	5940 (1811)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.	5	64	31		
PI-CS-24	6170 (1881)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; stage I caliche (1.0'-2.0').					
PI-CS-26	6390 (1948)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown to olive-gray, fine to coarse, poorly graded, subangular to subrounded, calcareous; little nonplastic silt; stage III caliche (1.0'-2.0').	4	77	19		
PI-CS-28	6440 (1963)	A5i	0.0 - 2.0 (0.0 - 0.6)	GW-GM	SANDY GRAVEL, light brown, fine to coarse, well graded, subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt; stage II caliche (1.0'-2.0').	58	36	6		

LOGS OF SURFICIAL SOIL SAMPLES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-7-1
1 OF 4

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
PI-CS-31	6200 (1890)	A5i	0.0 - 2.0 (0.0 - 0.6)	SW-SM	GRAVELLY SAND, light brown, fine to coarse, well graded, subangular to subrounded, calcareous; some fine to coarse gravel; trace nonplastic silt; stage II caliche (1.0'-2.0').	26	63	11		
PI-CS-33	6380 (1945)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel; stage I caliche (1.0'-2.0').	6	62	32		
PI-CS-35	6285 (1916)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine to coarse gravel; little nonplastic silt; stage II -III caliche (0.5'-2.0').					
PI-CS-37	6445 (1964)	A5o	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little nonplastic silt; little fine subangular gravel; stage III caliche (1.0'-3.0').					
PI-CS-39	6620 (2018)	A5i	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some nonplastic silt; trace fine gravel; stage I caliche (1.0'-3.0').	5	56	39		
PI-CS-40	6730 (2051)	A5o	0.0 - 3.0 (0.0 - 0.9)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt; stage II caliche (1.0'-3.0').					
PI-CS-42	6480 (1975)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel; occasional cobbles to 6" size; stage II-III caliche (1.0'-2.0').					
PI-CS-44	6305 (1922)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; some fine gravel; stage II caliche (1.0'-2.0').	26	45	29		
PI-CS-46	6140 (1871)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine subrounded gravel; stage II caliche (1.0'-2.0').	10	51	39		
PI-CS-47	6820 (2079)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt; trace fine gravel; stage I caliche (1.0 -2.0').	10	67	23		
PI-CS-49	6550 (1996)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; stage I caliche (1.0'-2.0').					
PI-CS-51	6090 (1856)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; stage I caliche (1.5'-2.0').					

LOGS OF SURFICIAL SOIL SAMPLES
PINE VALLEY, UTAH

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
PI-CS-53	5855 (1785)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some slightly plastic silt.					
PI-CS-57	5445 (1660)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.	4	74	22		
PI-CS-60	5255 (1602)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.					
PI-CS-63	5330 (1625)	A5y	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.					
PI-CS-65	5550 (1692)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; little fine to coarse gravel.	20	57	23		NP
PI-CS-67	5780 (1762)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine to coarse gravel.					
PI-CS-70	5620 (1713)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded subangular to subrounded, calcareous; some nonplastic silt.					
PI-CS-72	5380 (1640)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.					
PI-CS-74	5220 (1591)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.					
PI-CS-77	5210 (1588)	A4o	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt.	1	73	26		
PI-CS-79	5300 (1615)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.					
PI-CS-80	5480 (1760)	A5i	0.0 - 2.0 (0.0 - 0.6)	SM	GRAVELLY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine gravel; some nonplastic silt.	26	53	21		
PI-CS-82	5655 (1724)	A5i	0.0 - 2.0 (0.0 - 0.6)	GW-GM	SANDY GRAVEL, light brown, fine to coarse, well graded subangular to subrounded, calcareous; some fine to coarse sand; trace nonplastic silt.	55	33	12		
PI-CS-84	5370 (1637)	A5i	0.0 - 2.0 (0.0 - 0.6)	GM	SANDY GRAVEL, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some fine to coarse sand; little nonplastic silt; occasional cobbles to 6" size.					

LOGS OF SURFICIAL SOIL SAMPLES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
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FIGURE II-7-1
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FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS GR	SA	FI	LL	PI
PI-CS-86	5315 (1620)	A1	0.0 - 2.0 (0.0 - 0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; some nonplastic silt; trace fine gravel.	6	71	23		

LOG OF SURFICIAL SOIL SAMPLE
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-7-1
4 OF 4

FUGRO NATIONAL, INC.

8.0 LABORATORY TEST RESULTS

Explanation: Table II-8-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables II-8-2 through II-8-4 and Figures II-8-1 through II-8-2 present results of direct shear, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following list presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows:

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (by dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification Symbols are given here; see Table II-5-1 in Section 5.0, "Boring Logs", for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71.

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71).

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil.

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen.

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test as per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of 1) the weight in air of a given volume of soil solids at a stated temperature, to 2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure) and was then compressed (and hence sheared) by increasing the vertical stress. "Drained" indicates that excess pore water pressure generated by strains are permitted to dissipate by

the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1 - \sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure, and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_o). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to 1) increase saturation of the sample, or 2) simulate the actual in-situ pressure regime.

K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an

applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance (ksf) of a soil to shearing (tangential) stresses.

M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).

N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the list on the first page of these Explanations.

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested

for CBR were also analyzed for particle-size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop."

	D–10	50.0–50.4	15.24–15.36		
	D–11	60.0–60.6	18.29–18.47		
	D–13	80.0–80.5	24.38–24.54		
	D–14	90.0–90.5	27.42–27.58		
PI–B–2	P–1	0.2–1.0	0.06–0.30		
	P–2	3.0–4.6	0.91–1.40		
	D–3	6.0–6.5	1.83–1.98		
	D–4	10.2–10.9	3.11–3.32		
	D–5	15.1–15.7	4.60–4.79		
	D–6	20.2–20.9	6.16–6.37		
	D–7	25.2–25.9	7.68 -7.89		
	D–8	30.7–31.9	9.36–9.72		
	D–9	40.7–41.4	12.41–12.62		
	D–10	50.7–51.4	15.45–15.67		
	D–11	60.7–61.4	18.50–18.71		
	D–12	70.1–70.8	21.37–21.58		
	D–13	80.0–80.7	24.38–24.60		
	D–14	90.2–90.9	27.49–27.71		
	D–15	100.2–100.9	30.54–30.75		
	D–16	110.2–110.9	33.59–33.80		
	D–17	120.2–120.9	36.64–36.85		
	D–18	140.1–140.8	42.70–42.92		
	D–19	159.5–160.0	48.62–48.77		

									SM	127.9	2049	10.8	86.9	0.34				2.75	
31	15	10	9						GP–GM	137.4	2201	4.9	58.4	0.23					
									GM	133.8	2143	8.9	93.0	0.26					
36	24	19	15						SM	139.7	2238	7.6	98.7	0.21					
									SP–SM	125.2	2006	11.9	92.6	0.35					
									SP–SM	136.1	2180	8.3	93.7	0.24					
99	83	35	20						SM	88.4	1416	5.8	17.3	0.91					
97	83	62	46						SM	91.4	1464	24.2	79.3	0.81				2.65	
67	44	20	13						SM	105.8	1695	9.3	42.4	0.59					
95	68	41	33						SM	93.9	1504	10.1	34.2	0.80					
93	63	45	35					NP	SM	113.7	1821	6.6	37.0	0.48					
									SM	111.7	1789	7.9	41.9	0.51					
									SM	104.5	1674	12.0	53.0	0.61					
									SM	105.1	1684	8.1	36.2	0.60					
97	62	31	21						SM	109.8	1759	7.1	35.7	0.53					
									SM	117.7	1886	7.3	45.7	0.43					
									SM	105.2	1685	6.4	28.8	0.60					
									SP–SM	119.9	1921	10.8	71.0	0.41					
60	39	19	12						SP–SM	105.4	1689	11.6	52.4	0.60					
									SP–SM	120.6	1932	6.7	45.7	0.40					
79	43	19	14						SM	104.3	1671	8.2	36.2	0.62					
									SM	118.7	1902	6.8	44.0	0.42					
									SP–SM	116.5	1866	11.9	72.2	0.45					
84	50	23	16						SM	115.8	1855	7.2	42.8	0.46					
									SP–SM	118.7	1902	10.5	67.4	0.42					
89	67	51	44						SM	99.9	1600	20.6	81.1	0.69					
69	27	13	9						SW–SM	121.0	1938	8.1	56.6	0.39					
81	26	10	6						SW–SM	112.1	1796	5.5	29.7	0.50					
50	26	15	10						SW–SM	123.1	1972	7.3	53.6	0.37					
									SW–SM	123.9	1985	7.3	56.0	0.36					
94	75	59	50			37	21	16	SC	114.8	1839	16.3	94.4	0.47					
39	26	16	12						GP–GM	125.6	2012	9.3	73.3	0.34					
									SP–SM	119.3	1911	11.7	76.7	0.41					
41	19	12	9						SP–SM	125.3	2007	8.3	65.3	0.36					
									SP–SM	121.3	1943	8.3	57.6	0.39					

SUMM

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ITY (g/m^3)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
		2.75						
		2.66			*			
							*	
				*				
							*	

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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FUGRO NATIONAL, INC.

AFV-01

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D–4	10.7–11.4	3.26–3.47					
D–5	15.7–16.4	4.79–5.00					
D–6	20.7–21.4	6.31–6.52					
D–7	25.2–25.9	7.68–7.89					
D–8	30.7–31.4	9.36–9.57					
D–9	34.4–35.1	10.49–10.70					
D–10	41.3–41.9	12.59–12.77					
b–11	50.0–50.5	15.24–15.39					100
D–12	60.2–60.9	18.35–18.56					
D–13	70.2–70.9	24.40–21.61					
D–14	81.0–81.6	24.69–24.87					100
D–15	90.2–90.9	27.49–27.71					
D–16	100.2–100.9	30.54–30.75					
D–17	110.2–110.9	33.59–33.80					
D–18	123.0–123.7	37.49–37.70					
D–19	140.0–140.7	42.67–42.89					
D -20	160.0–160.7	48.77–48.98					

			SW–SM			14.9		
			SW–SM	112.1	1796	6.6	35.6	0.50
			SW–SM	108.9	1745	6.3	31.4	0.55
			SM	110.8	1775	6.6	34.0	0.52
			SM	111.7	1789	6.2	32.7	0.51
			SM	110.9	1777	3.9	20.4	0.52
			SW–SM	106.1	1700	9.0	41.3	0.59
			SW–SM	108.4	1737	6.2	30.0	0.56
			SW–SM	107.2	1717	9.8	46.5	0.57
			GW–GM					
			SW–SM	111.2	1781	7.3	38.4	0.52
			SW–SM	111.4	1785	10.4	54.0	0.51
			SW–SM	120.8	1935	10.6	72.7	0.40
			SW–SM	123.8	1983	7.0	52.8	0.36
58	41	17	SM	94.7	1517	21.7	75.2	0.78
			SM	117.2	1878	9.2	56.6	0.44
			SM	118.6	1900	10.6	68.0	0.42
			SM	121.7	1950	9.4	66.2	0.39
			SM	116.8	1871	9.5	58.1	0.44

ED							
OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
				*			
				*			
						*	
	2.66			*			

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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FUGRO NATIONAL, INC.

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	D -4	12.2 12.9	3.72–3.93			
	D 5	16.0 16.7	4.88 5.09			
	D 6	20.1 20.8	6.13 6.34			
	D 7	30.1 30.8	9.17 9.39			
	D 8	40.0 40.6	12.19 12.37			
	D 9	50.2 50.9	15.30 15.51			
	D 10	60.2 60.9	18.35 18.56			
	D 11	70.2 70.7	21.40 21.55			
	b-12	81.5 82.0	24.84 24.99			
	b 13	91.0–91.5	27.74 27.89			
	D–15	110.0 110.4	33.53 33.65			
	D–16	120.2 120.9	36.64–36.85			
	D–17	140.0 140.7	42.67 42.89			
PI B-9	b 1	0.5–1.0	0.15 0.30			
	D–2	3.2–3.9	0.98 1.19			
	D 3	6.0 6.7	1.83 2.04			
	D-4	10.2 10.9	3.11–3.32			

BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS
U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	
SAND				SILT OR CLAY															
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)		
										SM	94.8	1519	21.5	74.4	0.78				
										SM	102.4	1640	12.0	50.2	0.65				
70	63	37	19	13						SM									
										SP	109.0	1746	12.5	62.0	0.55				
82	66	33	16	10						SW-SM	114.2	1829	8.1	46.1	0.48				
										SM	128.3	2055	5.6	47.9	0.31				
	100	66	25	13						SM	99.0	1586	5.0	19.1	0.70				
90	87	69	31	16						SM	110.5	1770	10.9	56.4	0.53				
										SP SM	125.7	2014	5.3	41.9	0.34				
85	81	69	30	13						SM	115.3	1847	3.9	22.7	0.46				
										SM	106.8	1711	9.0	42.2	0.58				
68	59	41	19	12						SP-SM	126.4	2025	4.0	32.4	0.33				
										SP SM	120.7	1934	5.2	35.7	0.40				
										SP-SM	123.1	1972	9.0	65.7	0.37				
90	88	72	35	18						SM	111.6	1788	6.5	34.3	0.51				
										SM	115.1	1844	7.0	40.9	0.46				
										SM	108.9	1745	16.3	80.5	0.55				
89	71	53	29	20						SM									
69	33	18	11	8						SP-SM									
										SM	127.5	2043	8.5	71.1	0.32				
										SM	116.2	1862	7.6	45.7	0.45				
89	83	66	28	16						SM	116.2	1862	10.7	64.1	0.45				
85	80	71	38	18						SM									
57	50	41	26	21						GM	117.0	1874	4.6	27.9	0.44				
										GM	136.5	2187	4.2	48.0	0.23				
57	45	35	20	13						SM	129.7	2078	3.3	30.1	0.30				
										SP-SM	119.8	1919	5.3	35.2	0.41				
66	55	42	18	11						SP-SM	118.4	1897	10.2	66.3	0.41				2.68
										GM	137.1	2196	5.2	61.6	0.23				
73	67	55	28	14						SM	122.1	1956	5.9	42.2	0.38				
74	67	51	23	14						SM	120.7	1934	4.4	30.3	0.40				
										SM	124.1	1988	9.1	68.9	0.36				
48	36	23	15	10						GW-GM									
										GP-GM	135.9	2177	7.8	84.7	0.24				
55	50	37	20	11						GP-GM									
										SM	123.1	1972	9.8	71.8	0.37				
60	47	31	16	10						SP-SM	128.1	2052	9.3	79.7	0.32				
										SM	121.7	1950	10.9	76.3	0.38				
										GM	138.7	2222	6.3	79.5	0.22				

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COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
MAXIMUM Y DENSITY		OPTIMUM MOISTURE (%)							
t)	(kg/m³)								
					*			
			2.68						

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
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FUGRO NATIONAL, INC.

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING							U S STANDARD SI		
				BLDRS.	COBBLES		GRAVEL				SAND		
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40
PI B 10	D 1	0.7 1.4	0.21 0.43						100	98	97	92	65
	D 2	3.2 3.9	0.98 1.19						100	98	89	75	33
	b 3	6.0 6.4	1.83 1.95					100	90	85	73	57	20
	b 4	7.5--7.9	2.29–2.41										
	D 5	10.7 11.4	3.26 3.47										
	b 6	15.0 15.4	4.57 4.69					100	80	67	53	43	15
	D 7	20.7 21.4	6.31 6.52					100	92	91	88	82	53
	D 8	25.7 26.4	7.83 8.05										
	D 9	29.7 30.4	9.05 9.27										
	D 10	40.2 40.9	12.25 12.47										
	D 11	50.0 50.7	15.24 15.45						100	94	80	60	29
	D 12	60.5 61.2	18.44--18.65										
	D 13	70.7 71.4	21.55-21.76										
	P 14	80.0 80.8	24.38 24.63										
	D 15	90.7 91.5	27.65-27.89								100	98	72
	D 16	100.2 100.9	30.54 30.75										
	D 17	110.7 111.4	33.74 34.05								100	97	76
	D 18	120.1-120.7	36.61 36.71						100	90	77	59	32
	D 19	140.7 141.4	42.89--43.10										
	D 20	159.2 159.9	48.52-48.74										
PI-T 1	B 1	0.5 2.0	0.15--0.61						100	94	88	82	54
	b 3	10.0 11.0	3.05--3.35					100	86	73	62	45	17
PI T 2	B 1	0.5-2.0	0.15--0.61					100	84	68	63	61	51
	b-3	6.0 7.0	1.83 2.13					100	84	73	66	62	35
PI-T 3	B 1	0.5 2.0	0.15-0.61						100	91	85	80	70
PI-T-4	B-1	0.5-2.0	0.15 0.61					100	86	65	45	34	22
	b-2	3.0 4.0	0.91 1.22					100	98	76	54	33	17
	B 3	9.0 10.0	2.74-3.05					100	74	37	23	17	14
PI T 5	B 1	0.5 2.0	0.15-0.61								100	98	81
	b-2	4.0-5.0	1.22-1.52					100	89	74	62	48	21
PI-T 6	B-1	0.5-2.0	0.15-0.61						100	98	86	69	38
	b-2	3.0 4.0	0.91-1.22					100	98	89	64	34	8
PI T 7	B-1	0.5 2.0	0.15-0.61						100	99	98	91	55
PI T 8	B-1	0.5-2.0	0.15 0.61								100	94	51

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)
U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)		
SAND				SILT OR CLAY																
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)			
97	92	65	42	36						SM	90.6	1548	7.3	26.6	0.74					
89	75	33	14	10						SW SM	108.8	1743	3.0	14.9	0.55					
73	57	20	5	3						SP										
										SP										
										SP	122.3	1959	2.6	18.7	0.38					
53	43	15	6	4						SP										
88	82	53	17	11						SW SM	117.3	1879	5.0	31.1	0.44					
										SM	112.4	1801	8.8	47.5	0.50					
										SM	109.2	1749	10.5	52.0	0.54					
										SM	120.8	1935	9.2	62.9	0.39					
80	60	29	16	13						SM	121.2	1942	10.6	73.6	0.39					
										SM	114.3	1831	12.7	72.2	0.47					
										SM	116.6	1868	14.1	85.8	0.45					
										SM	105.9	1697	19.9	91.3	0.59					
100	98	72	49	36						SM	110.6	1772	11.9	61.4	0.52					
										SM	107.7	1725	16.1	76.7	0.57					
100	97	76	46	32						SM	109.8	1759	11.3	57.2	0.53					
77	59	32	17	11						SW SM	119.8	1919	9.2	61.1	0.41					
										SM	120.1	1924	8.7	58.3	0.40					
										SM	116.7	1870	10.9	66.3	0.44					
88	82	54	26	17						SM										
62	45	17	6	3						SP										
63	61	51	27	19						SM										
66	62	35	8	2						SP										
85	80	70	40	16						SM						127.5	2043	9.5	2.71	
45	34	22	14	10						GP GM										
54	33	17	10	7						SP SM										
23	17	14	11	9						GP GM										
100	98	81	44	31						SM						126.8	2031	10.5		
62	48	21	6	3						SP										
86	69	38	20	15						SM										
64	34	8	3	2						SW										
98	91	55	26	18						SM						118.3	1895	13.3		
100	94	51	26	19						SM										

SUM

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COMPACTED MAXIMUM [cut off]Y DENSITY ([cut off]f)	(kg/m^3)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
						*			
27.5	2043	9.5	2.71						*
26.8	2031	10.5							*
118.3	1895	13.3						*	*

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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FUGRO NATIONAL, INC.

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	100
PI T 9	B 1	0.5 2.0	0.15 0.61							100	94	[illegible]	[illegible]	27
	b 2	4.0 5.0	1.22 1.52							100	96	77	26	12
	b 3	8.5 9.0	2.59 2.74											
PI T 10	b 3	8.0 9.0	2.44 2.74						100	91	86	77	48	22
PI-T 12	B 1	0.5 2.0	0.15 0.61							100	98	89	63	34
	b 2	4.0 5.0	1.22 1.52						100	90	72	45	14	5
	b 4	8.0 9.0	2.44 2.74								100	98	93	86
	b 5	12.0 13.0	3.66 3.96						100	93	85	68	22	8
PI T 13	B 1	0.5 2.0	0.15 0.61					100	96	78	58	43	28	19
	B 3	9.0 10.0	2.74 3.05					100	72	34	19	11	5	3
	b 4	12.0 13.0	3.66 3.96					100	98	80	62	41	19	12
PI T 14	B 1	0.5 2.0	0.15 0.61							100	99	94	54	30
	B 2	2.0 3.0	0.61 0.91						100	96	86	65	14	2
	B 3	9.0 10.0	2.74 3.05				100	95	87	71	58	43	11	2
PI T 15	B 1	0.5 2.0	0.15 0.61						100	82	67	57	43	28
PI T 16	B 1	0.5 2.0	0.15 0.61					100	87	79	76	72	60	48
	b 2	4.0 5.0	1.22 1.52					100	97	77	56	40	24	15
	B 3	11.0 12.0	3.35 3.66					100	80	53	33	24	17	12
PI T 17	B 1	0.5 2.0	0.15 0.61						100	94	87	74	48	34
	b 2	4.0 5.0	1.22 1.52					100	84	61	49	37	14	4
	B 3	8.0 9.0	2.44 2.74				100	90	41	32	26	22	12	8
PI T 18	B 1	0.5 2.0	0.15-0.61					100	89	74	64	54	34	23
PI T 19	B 1	0.5 2.0	0.15 0.61							100	96	91	73	64
	b 2	10.0 11.0	3.05-3.35					100	75	67	57	47	27	19
PI P 1	b 1	0.5-2.0	0.15 0.61					100	93	77	58	43	28	21
PI-P 2	b 1	0.5 2.0	0.15-0.61					100	93	7	52	40	30	20
PI-P 3	B 1	0.5-2.0	0.15-0.61						100	97	93	88	58	28
PI P 4	b 1	0.5-2.0	0.15-0.61						100	97	91	82	48	19
PI P 5	B 1	0.5 2.0	0.15-0.61									100	93	86

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

			SM			
			SW			
38	20	18	CL			
			SW SM			
			SM			
			GP			
			SW–SM			
			SM			
			SP			
			SP			
			SM			
32	18	14	SC			
			GM			
			GP–GM			
			SM			
			GP			
			GP GM			
			SM			

COMPACTED									
MAXIMUM Y DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
f)	(kg/m³)								
								*	
9.5	1914	13.5							*
								*	
42.5	2283	6.0	2.74						*
19.5	1914	13.5						*	*
05.5	1690	19.6						*	*

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO	TABLE II-8-1 5 OF 8

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	b 2	3.0 4.0	0.91 1 22		
PI P-12	b 1	0.5 -2.0	0.15--0.61		
PI P 13	b 2	3.0 -4.0	0.91 1.22		
PI P -14	b--1	0.5 2.0	0.15-0.61		
PI P 15	b 2	4.0 -5.0	1.22 1.52		
PI P 16	B 1	0.5 - 2.0	0.15 -0.61		
	b -2	4.0 5.0	1.22 1.52		
PI P 17	B 1	0.5 2.0	0.15 0.61		
PI P 18	B -1	0.5 - 2.0	0.15 0.61		
	b 2	4.0 5.0	1.22 1.52		
PI P 19	B 1	0.5 2.0	0.15 -0.61		
PI P 20	B 1	0.5 2.0	0.15-0.61		
	b 2	4.0 -5.0	1.22 1.52		
PI P 21	b 1	0.5-2.0	0.15-0.61		

BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)
U S STANDARD SIEVE NO.					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)		
SAND				SILT OR CLAY																
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)			
7	87	48	25	18						SM										
4	79	29	4	1						SP										
73	61	30	6	4						SP						126.5	2027	6.0		
3	66	29	14	12						SP SM										
9	67	43	18	13						SM										
9	32	12	4	2						GW										
8	60	40	22	15						SM						121.4	1945	13.0		
3	53	12	2	1						SP										
3	78	34	17	14						SM										
7	86	33	11	8						SW SM										
0	97	52	35	29						SM										
8	75	17	3	2						SP										
2	80	45	25	19						SM						123.0	1970	10.6		
6	77	29	10	7						SW SM										
6	37	25	16	13						GM						136.5	2187	6.5	2.66	
0	75	67	55	47						SM										
	52	36	15	10						SP SM										
	39	28	20	16						GM										
		100	96	93			28	20	8	CL						114.0	1826	16.5	2.68	
	98	64	33	22						SM										
	43	28	17	13						GM										
	62	42	30	23						SM										

COMPACTED								
XIMUM DENSITY (kg/m^3)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
2027	6.0							*
1945	13.0							*
1970	10.6							*
2187	6.5	2.66						*
1826	16.5	2.68						*
1865	14.5						*	*

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-1
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FUGRO NATIONAL, INC.

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ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SIEVE NO			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	100
PI CS 4	b 1	0.5 2.0	0.15 0.61						100	97	92	87	76	42
PI CS 7	b 1	0.5 2.0	0.15 0.61					100	93	68	50	36	25	16
PI CS 9	b 1	0.5 2.0	0.15 0.61								100	99	64	31
PI CS 12	b 1	0.5 2.0	0.15 0.61									100	68	27
PI CS 14	B 1	0.5 2.0	0.15 0.61								100	98	88	61
PI CS 20	B 1	0.5 2.0	0.15 0.61							100	99	94	62	33
PI CS 22	b 1	0.5 2.0	0.15 0.61							100	95	83	48	34
PI CS 26	b 1	0.5 2.0	0.15 0.61						100	99	96	83	44	26
PI CS 28	b 1	0.5 2.0	0.15 0.61					100	90	61	42	29	17	9
PI CS 31	b 1	0.5 2.0	0.15 0.61					100	95	90	74	53	23	14
PI CS 33	b 1	0.5 2.0	0.15 0.61						100	98	94	86	66	44
PI CS 39	b 1	0.5 2.0	0.15 0.61							100	95	84	57	44
PI CS 44	b 1	0.5 2.0	0.15 0.61						100	84	74	62	45	34
PI CS 46	b 1	0.5 2.0	0.15 0.61						100	95	90	84	57	42
PI CS 47	b 1	0.5 2.0	0.15 0.61							100	90	87	47	28
PI CS 57	b 1	0.5 2.0	0.15 0.61							100	96	89	67	35
PI CS 65	b 1	0.5 2.0	0.15 0.61					100	89	86	80	73	53	32
PI CS 77	b 1	0.5 2.0	0.15 0.61							100	99	93	57	33
PI CS 80	B 1	0.5 2.0	0.15 0.61						100	88	74	61	44	28
PI CS 82	B 1	0.5 2.0	0.15 0.61					100	71	51	45	38	25	16
PI CS 86	b 1	0.5 2.0	0.15 0.61							100	94	87	65	34

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

GHT – STANDARD SIEVE NO. – SAND 10	40	100	SILT OR CLAY 200	PARTICLE SIZE (mm) .005	.001	ATTERBERG LIMITS (b) LL	PL	PI	USCS (c)	IN-SITU DRY UNIT WEIGHT (pcf)	(kg/m^3)	MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	(kg/m^3)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED
87	76	42	28						SM											
36	25	16	11						GW-GM											
99	64	31	21						SM											
100	68	27	15						SM											
98	88	61	47			36	18	18	SC						127.6	2044	10.0	2.68		
94	62	33	24						SM						125.7	2014	9.5			
83	48	34	31						SM											
83	44	26	19						SM											
29	17	9	6						GW-GM											
53	23	14	11						SW-SM											
86	66	44	32						SM											
84	57	44	39						SM											
62	45	34	29						SM											
84	57	42	39						SM											
87	[illegible]	28	23						SM											
89	67	35	22						SM											
73	53	32	23					NP	SM											
93	57	33	26						SM											
61	44	28	21						SM											
38	25	16	12						GW-GM											
87	65	34	23						SM											

SUMMAR

MX S
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CTED		SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
Y (m^3)	OPTIMUM MOISTURE (%)							
44	10.0	2.68					*	*
14	9.5							
							*	
							*	

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE
II-8-1
7 OF 8

FUGRO NATIONAL, INC.

AFV-01

, 3

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT										
				STANDARD SIEVE OPENING							U S STANDARD SI			
				BLDRS.	COBBLES		GRAVEL				SAND			
		FEET	METERS	24"	12"	6"	3"	1½"	3/4"	3/8"	4	10	40	1
PI F-1	b 1	1.0 1.5	0.30 0.46					100	94	90	86	81	52	2
PI F 2	B 1	1.0 1.5	0.30 0.46									100	99	9
	b 2	2.0 2.5	0.61 0.76									100	90	7
PI F 3	b 1	1.0 1.5	0.30 0.46										100	9
	b 2	2.0 2.5	0.61 0.76									100	98	9
PI F 4	B 1	1.0 1.5	0.30 0.46									100	69	3
	b 2	2.0 2.5	0.61 0.76					100	95	89	87	84	71	3
PI-F 5	B 1	1.0 1.5	0.30 0.46								100	98	70	2
	b 2	2.0 2.5	0.61 0.76									100	83	1
PI-F-6	b 1	1.0-1.5	0.30 0.46						100	93	84	79	69	3
	b 2	2.0 2.5	0.61 0.76						100	97	93	88	78	4
PI-F 7	B 1	1.0 1.5	0.30 0.46									100	86	6
	b 2	2.0 2.5	0.61-0.76									100	91	7
PI-F-8	b 1	1.0 1.5	0.30 0.46						100	97	95	93	72	3
	b 2	2.0 2.5	0.61 0.76								100	99	84	4
PI-F 9	B-1	1.0-1.5	0.30 0.46						100	89	83	76	56	3
	b 2	2.0 2.5	0.61-0.76						100	97	87	78	56	3
PI-F-10	b 1	1.0 1.5	0.30 0.46						100	99	93	83	60	3
PI-F-11	B 1	1.0-1.5	0.30 0.46						100	95	91	85	66	40
PI-F-12	B 1	1.0-1.5	0.30-0.46								100	99	61	3
	b-2	2.0 2.5	0.61-0.76								100	97	55	3
	b-3	3.0-3.5	0.91 1.07											
PI-F-13	B 1	1.0 1.5	0.30 0.46						100	83	67	51	26	12
PI-F-14	B-1	1.0-1.5	0.30-0.46							100	98	90	66	52
PI-F-15	b 1	1.0 1.5	0.30 0.46							100	96	85	56	43
	b 2	2.0 2.5	0.61-0.76											
	b-3	3.0 3.5	0.91 1.07							100	95	88	62	49

NOTES:

(a) Sample types
- SS – Standard split spoon
- P – Pitcher
- D – Fugro Drive
- B,b – Bulk

(b) NP – Not Plastic

(c) USCS – Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

	100	83	18	12						SP SM		
84	79	69	39	22						SM		
93	88	78	47	22						SM		
	100	86	69	61			42	21	21	CL		
	100	91	72	53					NP	ML		
95	93	72	39	28						SM		
100	99	84	41	30						SM		
83	76	56	35	27						SM		
87	78	56	33	24						SM		
93	83	60	34	25						SM		
91	85	66	40	30						SM		
100	99	61	38	31						SM		
100	97	55	34	29						SM		
										SM		
67	51	26	12	8						SP–SM		
98	90	66	52	46			42	26	16	SM		
96	85	56	43	38			31	20	11	SC		
										SC		
95	88	62	49	44			35	21	14	SC		

...OMPACTED								
...IMUM ...ENSITY (kg/m³)	OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
1706	19.4							*
2044	9.9							*
1994	9.9							*
1842	15.3							*
2063	10.3							*
2022	10.9							*
2043	9.8							*
2035	10.0							*
1844	15.0							*

SUMMARY OF LABORATORY TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
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FUGRO NATIONAL, INC.

AFV-01

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m²	ksf	kN/m²
PI-B-2	P-2	3.0 - 4.6	0.91 - 1.40	SM	0.3	14	0.51	24
					0.5	24	0.56	27
					0.6	29	0.64	31
PI-B-2	D-13	80.0 - 80.7	24.38 - 24.60	SP-SM	8.0	383	7.69	368
					10.0	479	10.50	503
PI-B-5	D-13	80.2 - 80.9	24.44 - 24.66	SM	8.0	383	9.57	458
PI-B-6	D-3	6.7 - 7.4	2.04 - 2.26	SW-SM	0.7	34	1.22	58
					1.0	48	1.62	78
					1.4	67	2.11	101
PI-B-7	D-12	70.1 - 70.6	21.37 - 21.52	SM	7.0	335	7.84	375
					10.0	479	9.33	447
PI-B-8	D-9	50.2 - 50.9	15.30 - 15.51	SM	5.0	239	4.41	211
					7.5	359	5.86	281
					10.0	479	8.38	401
PI-B-10	D-7	20.7 - 21.4	6.31 - 6.52	SW-SM	2.0	96	4.83	231
					3.0	144	4.53	217
					4.0	192	5.43	260

DIRECT SHEAR TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-2

FUGRO NATIONAL, INC.

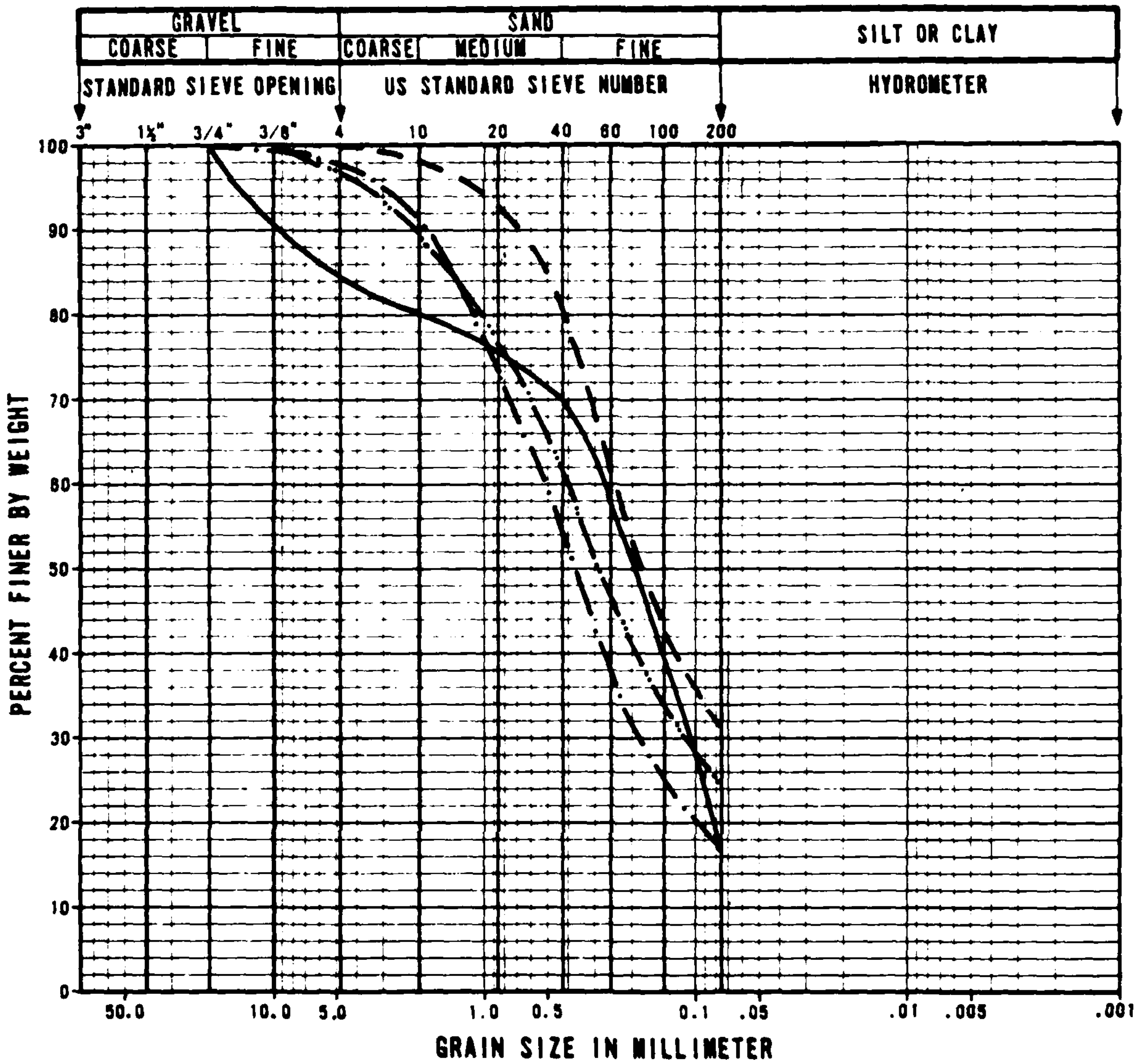
ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM mg/kg	CHLORIDE mg/kg	SULPHATE mg/kg	CALCIUM mg/kg	mg/kg
PI-B-2	D-9	40.7 - 41.4	12.41 - 12.62	SM	8.1	48	25	< 5	70	246
PI-B-5	D-7	25.5 - 26.2	7.77 - 7.99	GP-GM	8.1	75	141	54	40	516
PI-B-6	D-14	81.0 - 81.6	24.69 - 24.87	SW-SM	8.2	39	43	< 5	39	390
PI-T-7	B-1	0.5 - 2.0	0.15 - 0.61	SM	8.7	145	18	< 5	351	880
PI-T-9	b-3	8.5 - 9.0	2.59 - 2.74	SW-SM	7.5	132	412	47	25	540
PI-T-16	B-1	0.5 - 2.0	0.15 - 0.61	SC	8.6	22	10	<5	111	600
PI-P-3	B-1	0.5 - 2.0	0.15 - 0.61	SM	9.5	290	66	14	250	535
PI-P-5	B-1	0.5 - 2.0	0.15 - 0.61	ML	8.7	566	84	105	136	419
PI-P-24	B-1	0.5 - 2.0	0.15 - 0.61	SM	8.5	17	11	<5	139	558
PI-CS-14	B-1	0.5 - 2.0	0.15 - 0.61	SC	8.5	380	300	222	81	336
PI-CS-26	b-1	0.5 - 2.0	0.15 - 0.61	SM	8.7	23	2	<5	352	1630
PI-CS-82	B-1	0.5 - 2.0	0.15 - 0.61	GW-GM	8.9	28	200	95	106	264

SUMMARY OF CHEMICAL TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE II-8-3

FUGRO NATIONAL, INC.



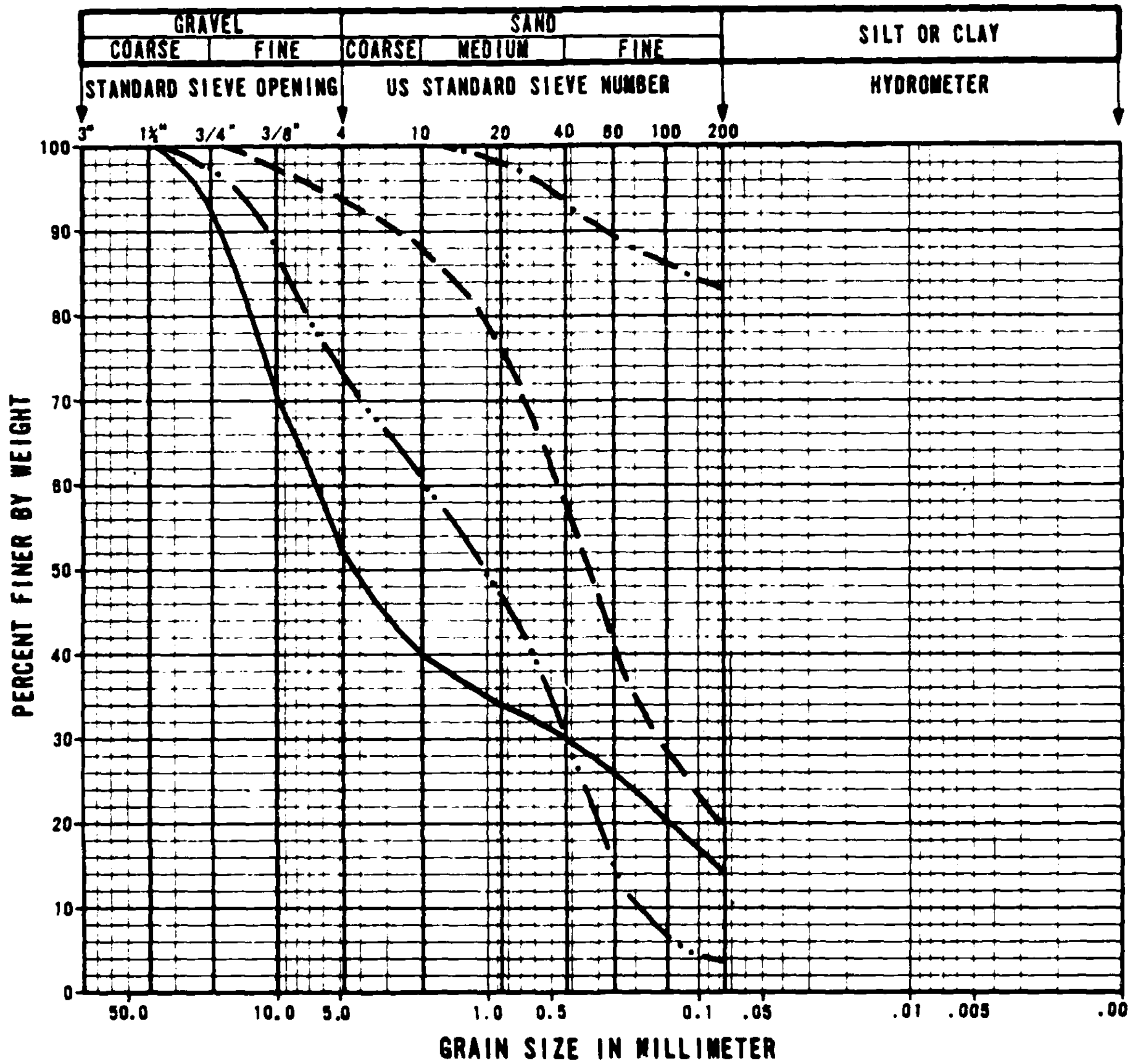
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
——	A	PI-T-3	0.5 - 2.0	0.15 - 0.61	SM
— —	B	PI-T-5	0.5 - 2.0	0.15 - 0.61	SM
—·—	C	PI-T-7	0.5 - 2.0	0.15 - 0.61	SM
—··—	D	PI-T-12	0.5 - 2.0	0.15 - 0.61	SM

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-1
1 OF 6

FUGRO NATIONAL, INC.



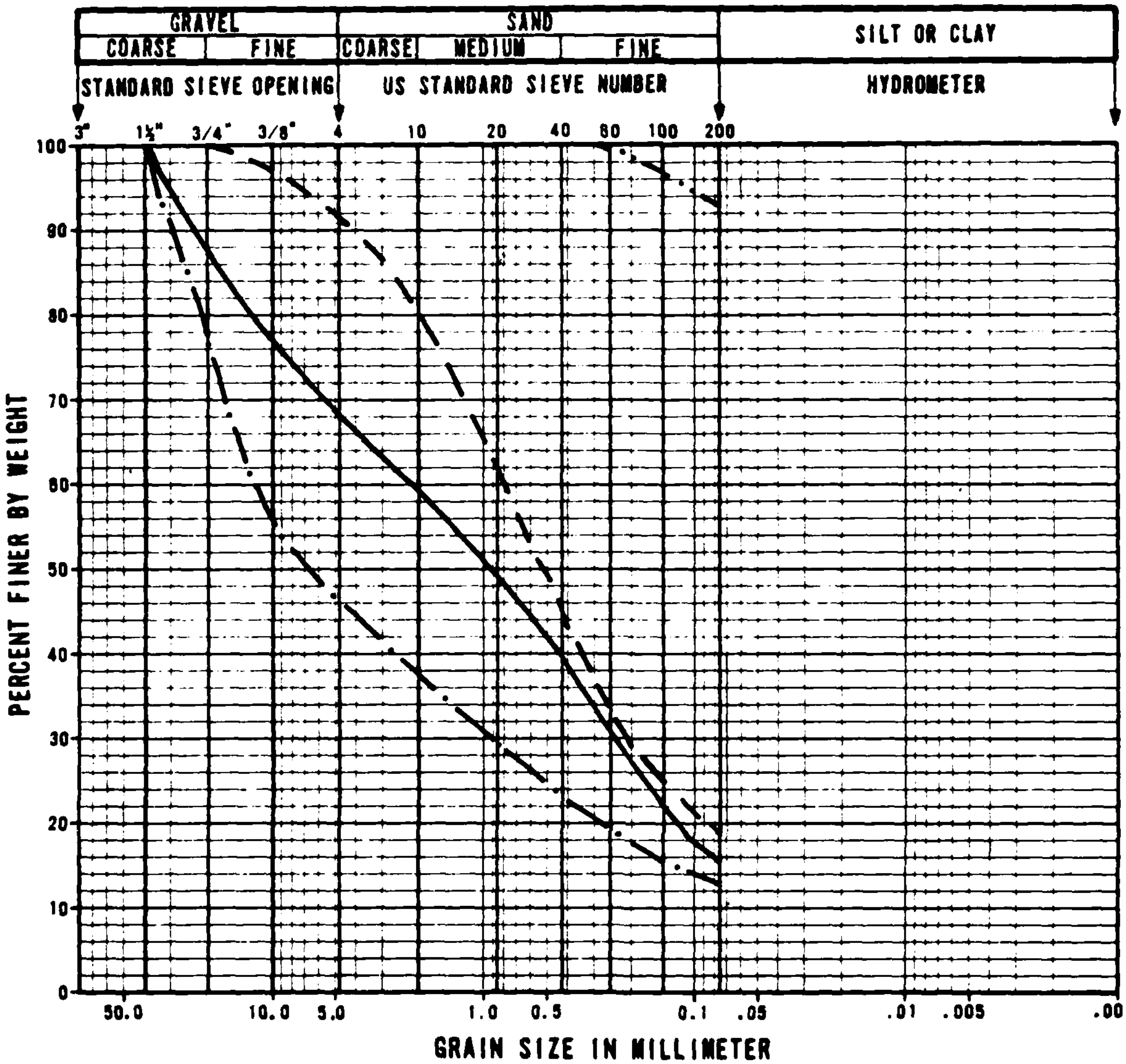
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	E	PI-P-2	0.5 - 2.0	0.15 - 0.61	GM
— —	F	PI-P-3	0.5 - 2.0	0.15 - 0.61	SM
—•—	G	PI-P-5	0.5 - 2.0	0.15 - 0.61	ML
—••—	H	PI-P-7	0.5 - 2.0	0.15 - 0.61	SP

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-8-1
2 OF 6

FUGRO NATIONAL, INC.



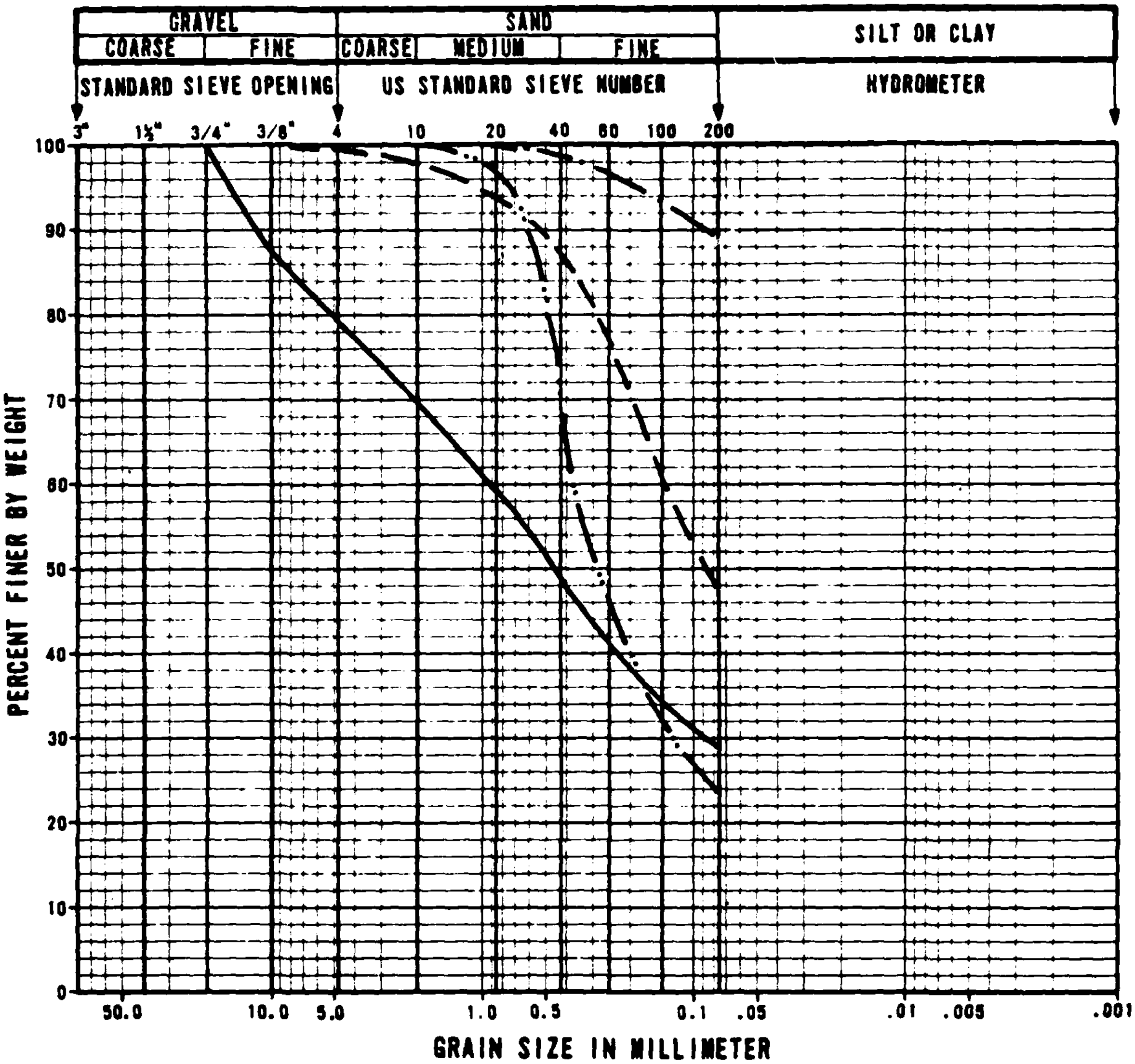
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	I	PI-P-10	0.5 - 2.0	0.15 - 0.61	SM
— —	J	PI-P-16	0.5 - 2.0	0.15 - 0.61	SM
—·—	K	PI-P-17	0.5 - 2.0	0.15 - 0.61	GM
—··—	L	PI-P-20	0.5 - 2.0	0.15 - 0.61	CL

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-1
3 OF 6

FUGRO NATIONAL, INC.



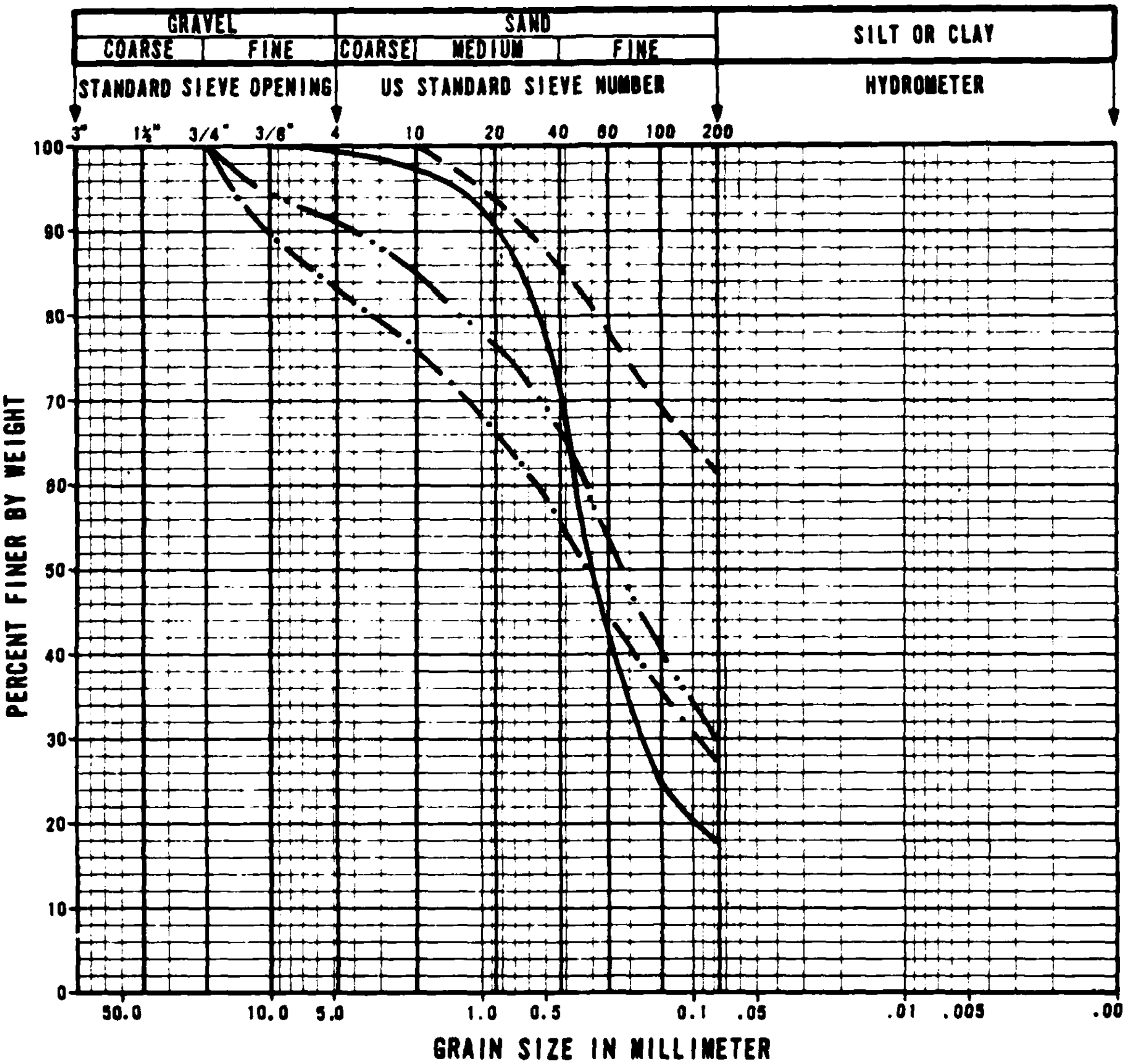
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	M	PI-P-24	0.5 - 2.0	0.15 - 0.61	SM
— —	N	PI-CS-14	0.5 - 2.0	0.15 - 0.61	SC
—·—	O	PI-F-2	1.0 - 1.5	0.30 - 0.46	ML
—··—	P	PI-F-4	1.0 - 1.5	0.30 - 0.46	SM

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE II-8-1
4 OF 6

FUGRO NATIONAL, INC.



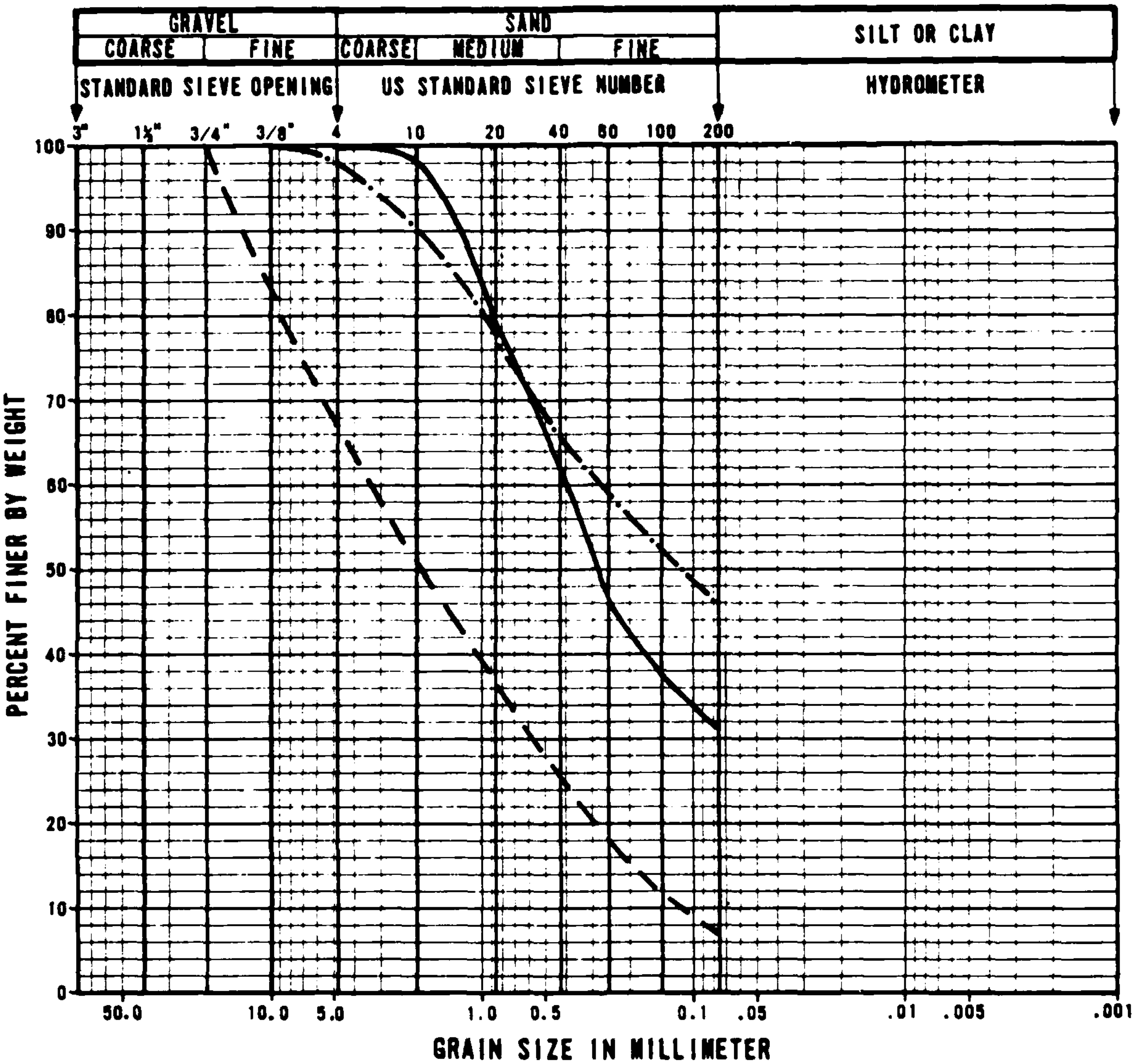
SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
——	Q	PI-F-5	1.0 - 1.5	0.30 - 0.46	SM
— —	R	PI-F-7	1.0 - 1.5	0.30 - 0.46	CL
—·—	S	PI-F-9	1.0 - 1.5	0.30 - 0.46	SM
—··—	T	PI-F-11	1.0 - 1.5	0.30 - 0.46	SM

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-1
5 OF 6

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE
———	U	PI-F-12	1.0 - 1.5	0.30 - 0.46	SM
— —	V	PI-F-13	1.0 - 1.5	0.30 - 0.46	SP-SM
—·—	W	PI-F-14	1.0 - 1.5	0.30 - 0.46	SM

GRAIN SIZE CURVES, CBR TESTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
II-8-1
6 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
A	SM	16			2.71	127.5	2043	9.5	120.7	1934	9.0	94.6	43
									114.8	1839	9.9	90.0	23
									108.7	1741	8.9	85.2	8
B	SM	31				126.8	2031	10.5	119.8	1919	12.6	94.5	23
									110.8	1775	10.8	87.4	9
									106.1	1700	10.7	83.7	2
C	SM	18				118.3	1895	13.3	112.4	1801	12.6	95.0	40
									103.2	1653	13.7	87.2	9
									90.7	1453	13.3	76.6	1
D	SM	25				119.5	1914	13.5	107.5	1722	13.5	89,9	14
									99.8	1599	13.0	83.5	5
									93.0	1490	13.0	77.8	2

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-4
1 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m3		pcf	kg/m3			
E	GM	15			2.74	142.5	2283	6.0	139.6	2236	4.8	98.0	121
									136.4	2185	4.8	95.7	56
									1303	2087	5.5	91.9	33
F	SM	20				119.5	1914	13.5	111.7	1789	14.2	93.5	51
									106.3	1703	15.3	88.9	22
									103.9	1664	14.9	86.9	14
G	ML	83	39	10		105.5	1690	19.6	96.4	1544	20.5	91.4	5
									89.7	1437	20.3	85.1	2
									78.3	1254	20.2	74.2	1
H	SP	4				126.5	2027	6.0	121.9	1953	5.5	96.4	22
									113.1	1812	5.2	89.4	5
									107.5	1722	5.7	85.0	2

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-4
2 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
I	SM	15				121.4	1945	13.0	113.5	1818	13.1	93.5	27
									107.7	1725	15.4	88.7	15
									100.9	1616	13.3	83.1	7
J	SM	19				123.0	1970	10.6	117.1	1876	10.6	95.2	50
									106.6	1708	10.4	86.7	9
									99.6	1596	10.8	80.9	3
K	GM	13			2.66	136.5	2187	6.5	131.3	2103	6.3	96.2	63
									123.6	1980	5.8	90.6	15
									117.2	1878	5.7	85.8	3
L	CL	93	28	8	2.68	114.0	1826	16.5	103.8	1663	16.0	91.0	5
									98.6	1580	16.7	86.4	5
									89.6	1435	16.1	78.6	2

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-4
3 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
M	SM	29				116.4	186.5	14.5	106.4	1705	14.5	91.4	20
									101.0	1618	15.1	86.8	9
									92.9	1488	13.7	79.8	2
N	SC	47	36	18	2.68	127.6	2044	10.0	115.0	1842	11.0	90.1	5
									106.5	1706	11.0	83.5	5
									96.4	1544	11.2	75.5	1
O	ML	90	35	9		106.5	1706	19.4	98.3	1575	19.0	92.3	9
									95.1	1524	18.9	89.3	4
									84.6	1355	19.0	79.4	3
P	SM	23				127.6	2044	9.9	117.3	1879	9.9	91.9	32
									108.9	1745	10.3	85.4	7
									103.7	1662	10.0	81.3	5

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-4
4 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
Q	SM	19				124.5	1994	9.0	115.3	1847	8.9	92.6	39
									108.8	1743	9.1	87.4	8
									100.5	1611	8.5	80.8	6
R	CL	61	42	21		115.0	1842	15.3	103.7	1661	14.9	90.2	2
									94.2	1510	15.0	82.0	1
									89.5	1434	15.1	77.8	1
S	SM	27				128.8	2063	10.3	116.9	1873	9.8	90.8	27
									110.2	1765	10.5	85.5	7
									104.8	1679	10.9	81.4	1
T	SM	30				126.2	2022	10.9	117.3	1880	11.4	93.0	37
									106.5	1706	10.3	84.4	7
									99.8	1599	10.9	79.1	3

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

TABLE
II-8-4
5 OF 6

FUGRO NATIONAL, INC.

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
U	SM	31				127.5	2043	9.8	122.2	1958	9.9	95.8	45
									116.2	1862	9.8	91.2	16
									103.8	1663	9.3	81.4	2
V	SP-SM	8				127.0	2035	10.0	118.5	1898	10.1	93.3	31
									110.8	1775	10.0	87.3	8
									97.8	1567	10.3	77.0	1
W	SM	46	42	16		115.1	1844	15.0	106.4	1704	14.4	92.4	5
									100.5	1611	14.5	87.4	3
									90.9	1456	14.7	79.0	1

CALIFORNIA BEARING RATIO (CBR)
TEST RESULTS
PINE VALLEY, UTAH

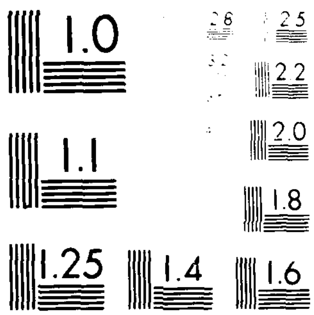
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

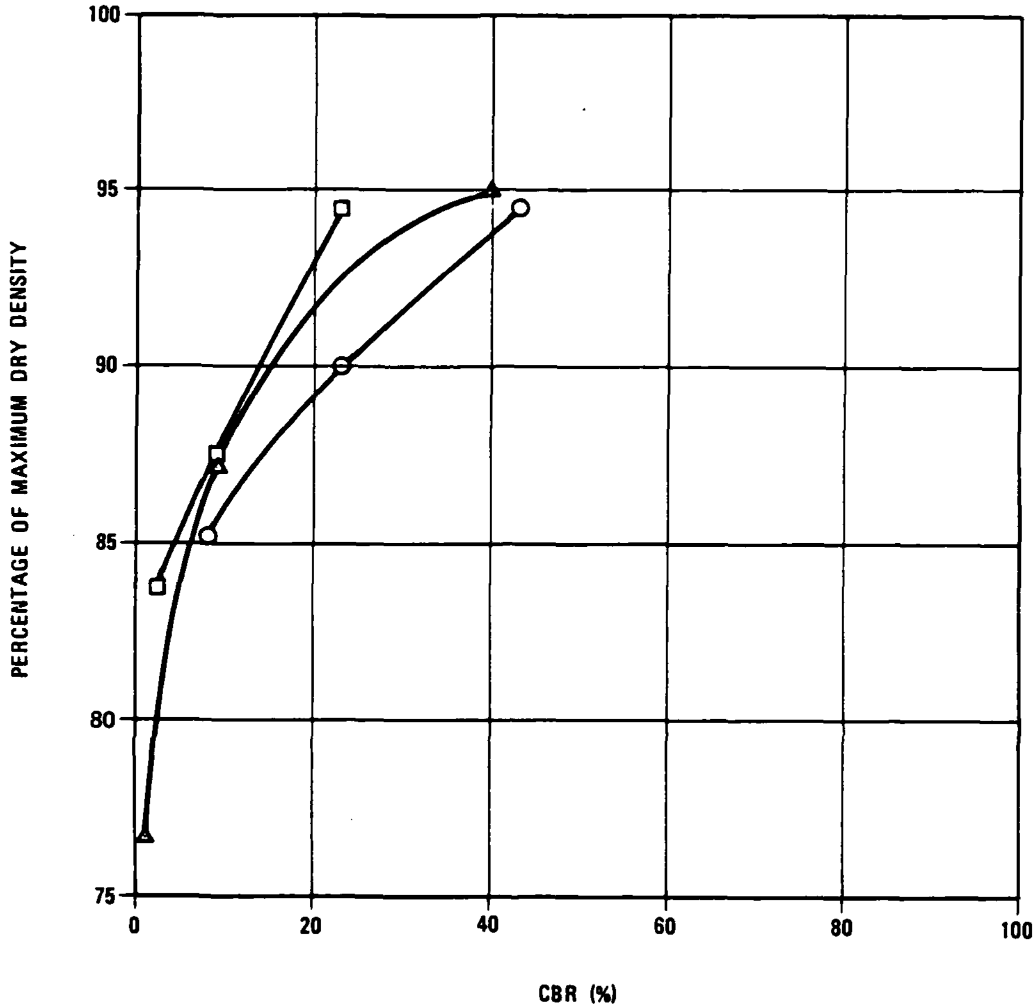
TABLE
II-8-4
6 OF 6

FUGRO NATIONAL, INC.

AD-A112 849 FUGRO NATIONAL INC LONG BEACH CA F/G 8/7
MX SITING INVESTIGATION GEOTECHNICAL EVALUATION, VERIFICATION S--ETC(U)
MAR 81 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-PI-2 NL

3 of 4
AD A
112849


1.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6



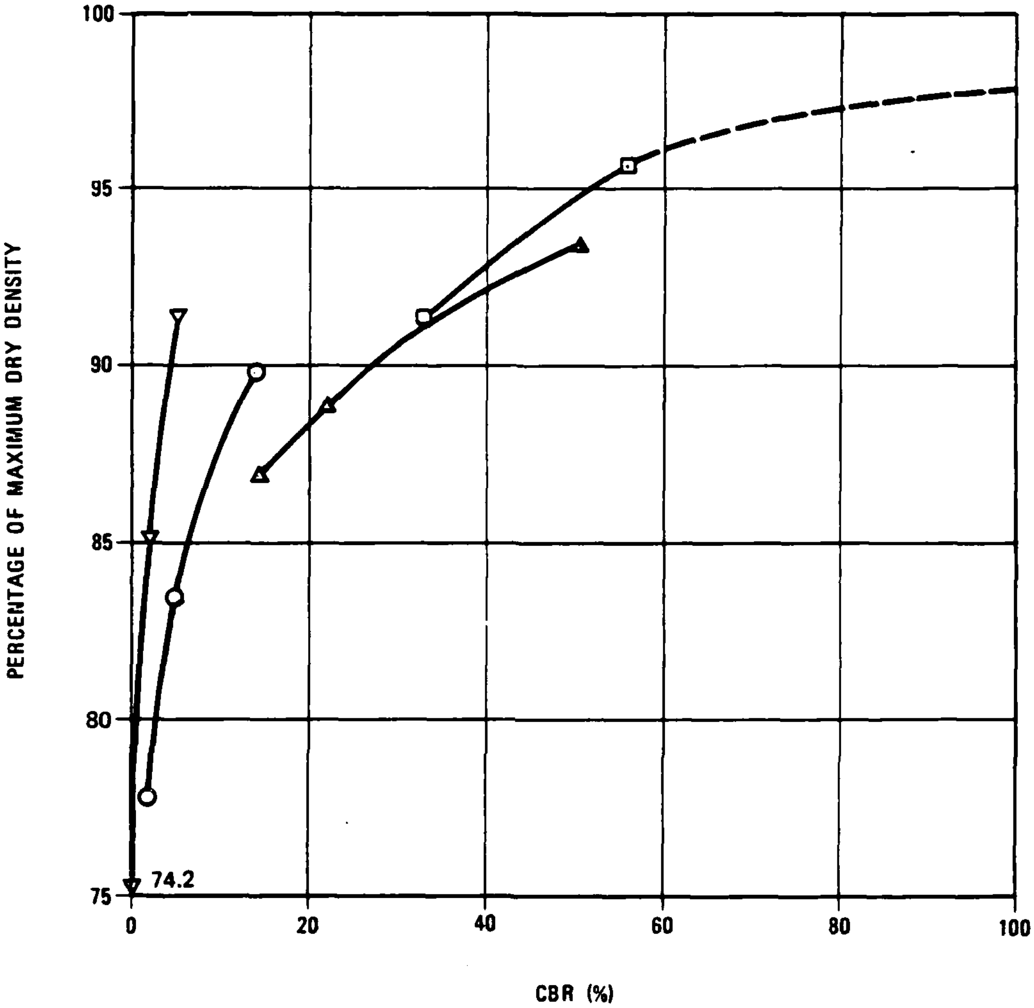
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	SM
△	C	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-8-2
1 OF 7

FUGRO NATIONAL, INC.



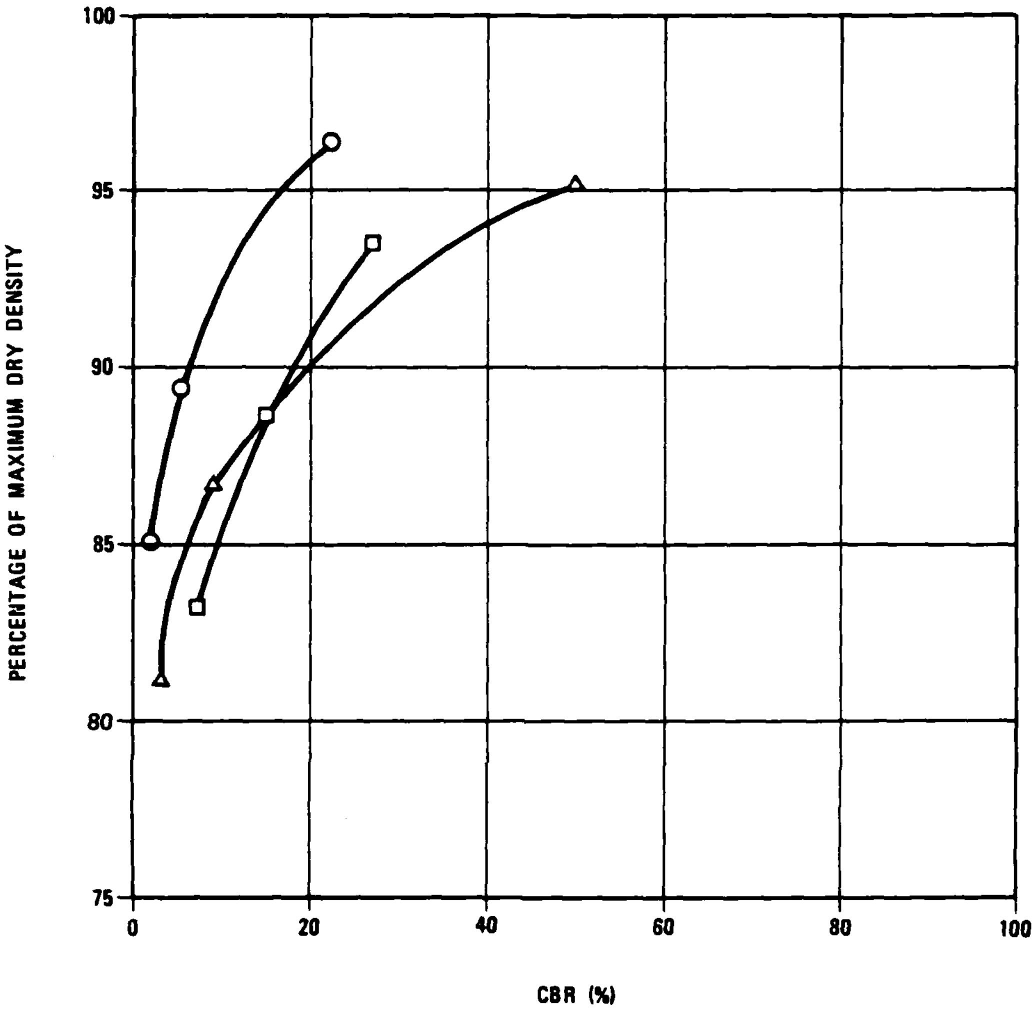
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	D	SM
□	E	GM
△	F	SM
▽	G	ML

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE II-8-2
2 OF 7

FUGRO NATIONAL, INC.



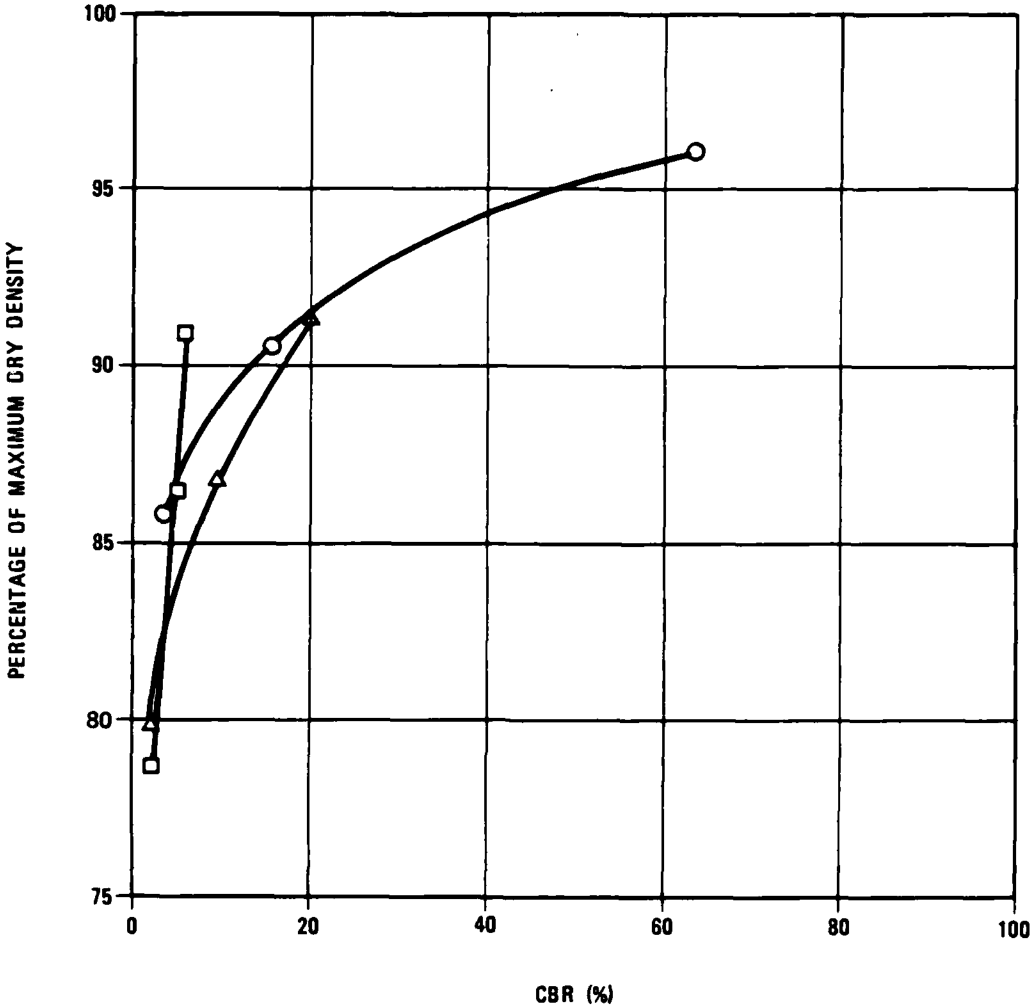
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	H	SP
□	I	SM
△	J	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-8-2
3 OF 7

FUGRO NATIONAL, INC.



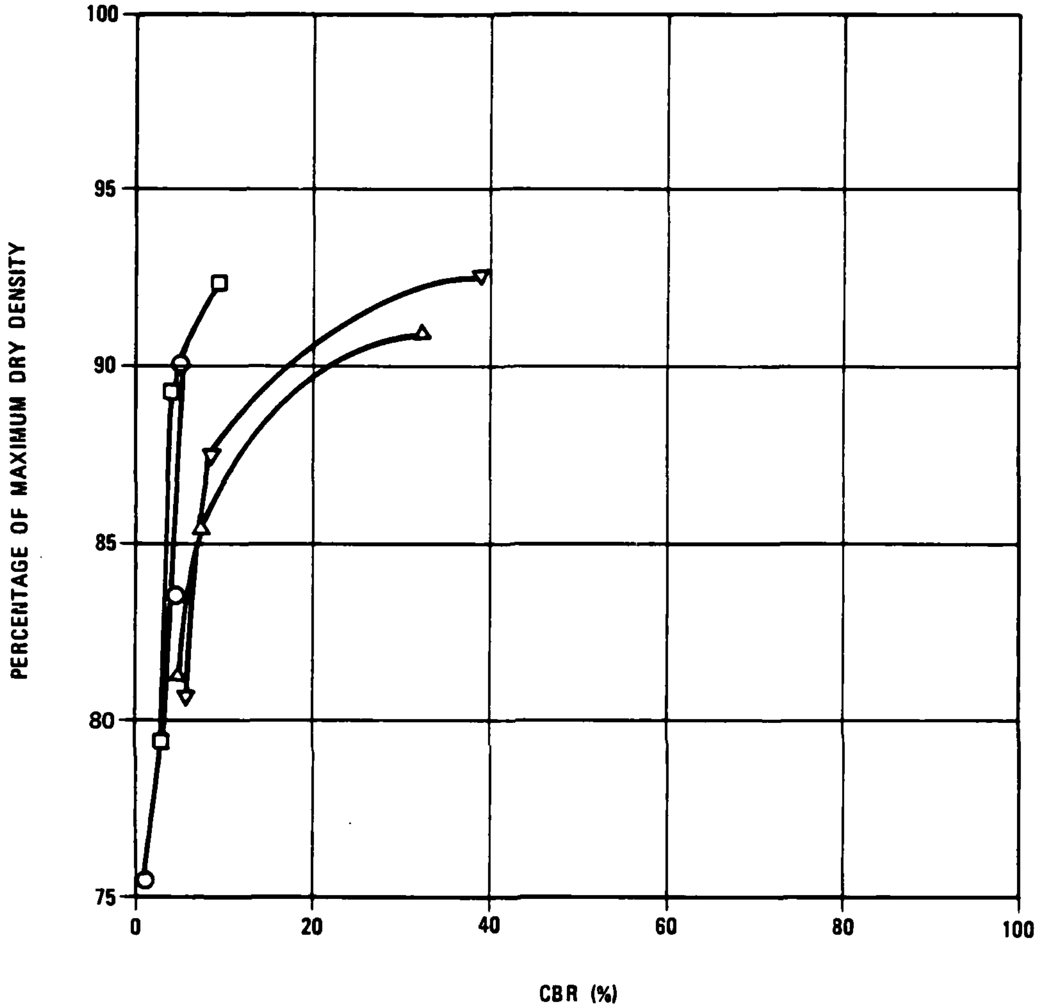
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	K	GM
□	L	CL
△	M	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-8-2
4 OF 7

FUGRO NATIONAL, INC.



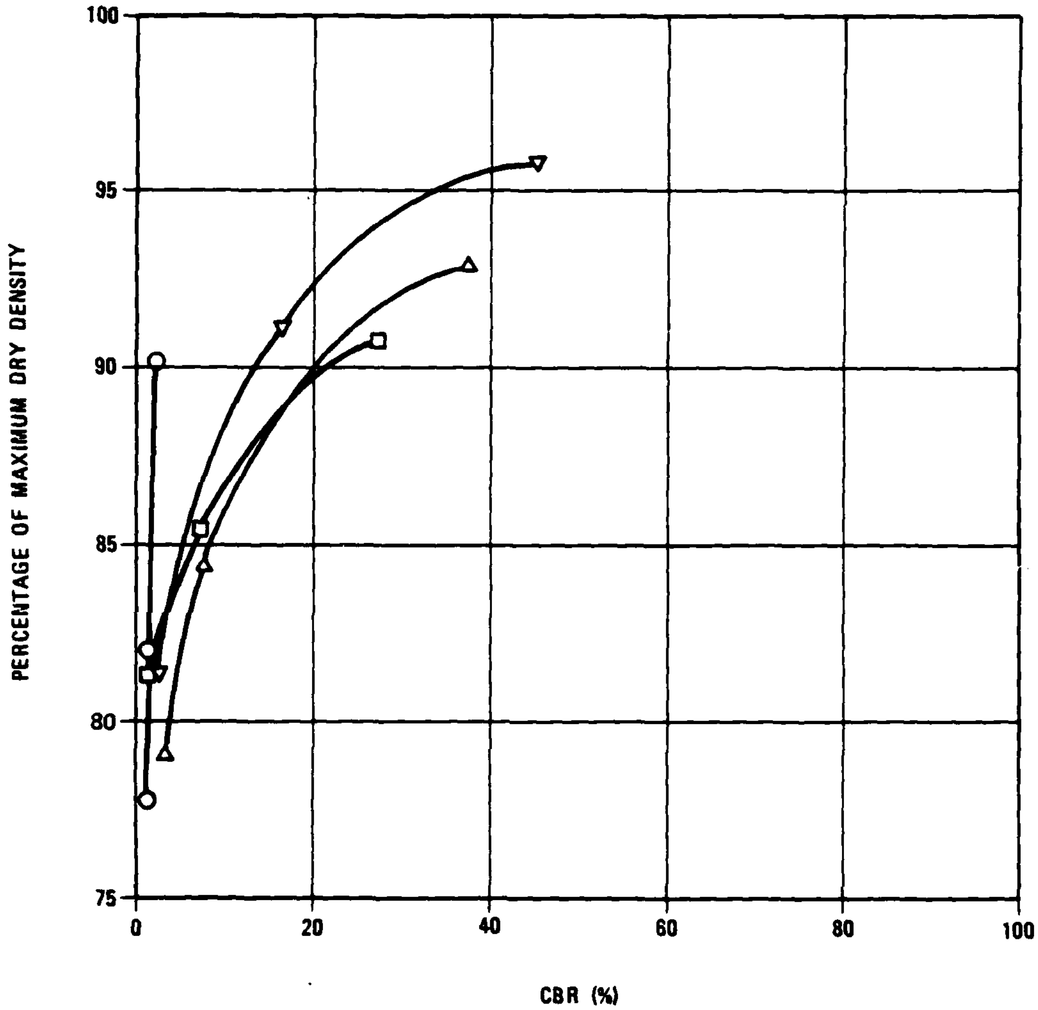
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	N	SC
□	O	ML
△	P	SM
▽	Q	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-8-2
5 OF 7

FUGRO NATIONAL, INC.



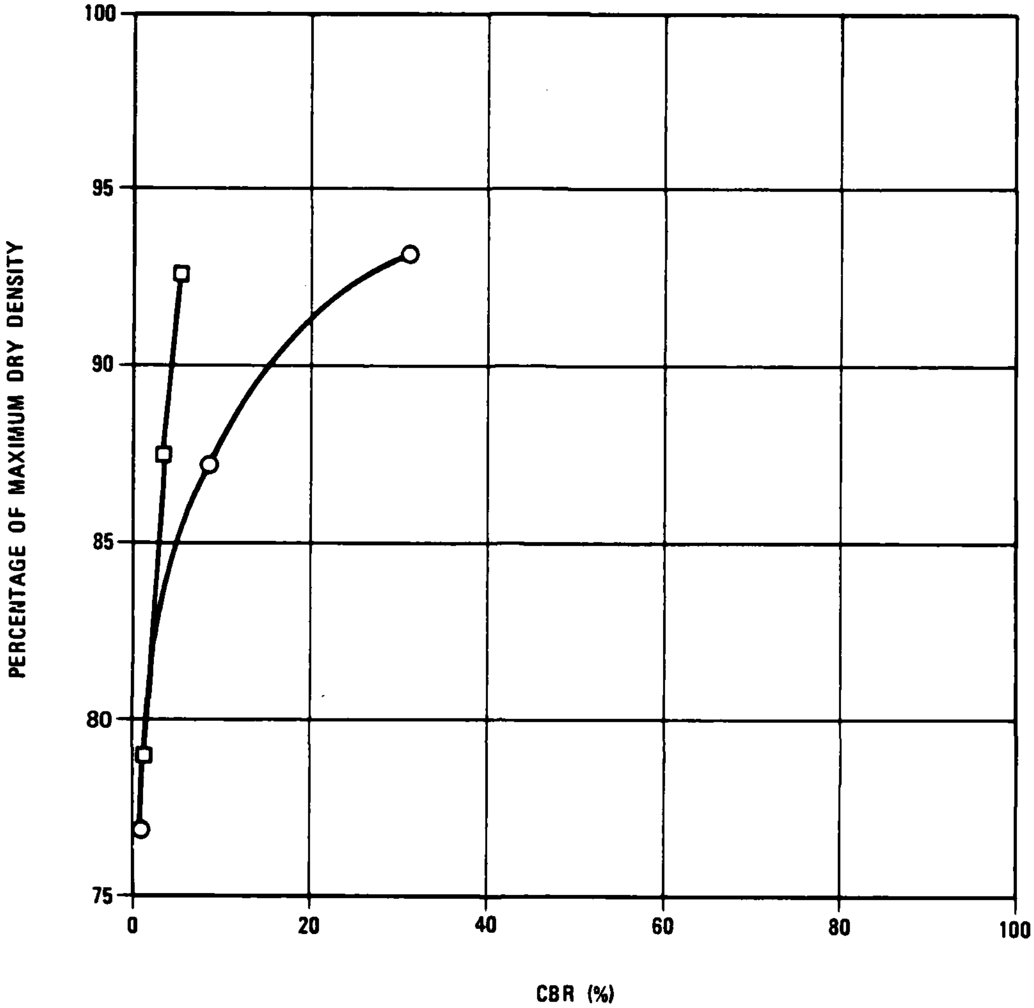
SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	R	CL
□	S	SM
△	T	SM
▽	U	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

FIGURE II-8-2
6 OF 7

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	V	SP-SM
□	W	SM

CALIFORNIA BEARING RATIO (CBR) CURVES
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE — BMO

FIGURE
II-8-2
7 OF 7

FUGRO NATIONAL, INC.

9.0 FIELD CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

Explanation: The results of the field CBR tests are tabulated in this section. Explanations of the column headings in Table II-9-1 follow.

A. Designations - Field CBR tests are identified as follows:

PI - F-1
PI - abbreviation for the valley (e.g., PI-Pine)
F - abbreviation for field CBR
1 - number of activity

B. Ground-Surface Elevation - Indicated elevations on the logs are estimated from topographic maps of the study area within an accuracy of half the contour interval.

C. Surficial Geologic Unit - Indicates the surficial geologic unit in which the activity is located.

D. Depth - Indicates depth interval for which soil description is given.

E. USCS - Unified Soil Classification Symbol; see Table II-5-1 of Section 5.0, "Boring Logs," for details of USCS.

F. Grain-Size Distribution and Plasticity - These are from results of laboratory tests. See Section 5.0, "Boring Logs," for explanation.

G. In-Situ Dry Unit Weight - These are from results of field tests performed in accordance with ASTM D 1556-64, "Test for Density of Soil in Place by the Sand-Cone Method."

H. Moisture Content - These are from results of laboratory tests performed in accordance with ASTM D 2216-71, "Laboratory Determination of Moisture Content of Soil."

I. Estimated Percent of Maximum Dry Density - This indicates the ratio (as a percentage) of the in-situ dry unit weight obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5-kg) Hammer and 18-inch (457-mm) Drop" at that site or from a compatible site with matching grain-size distribution.

J. Average Field CBR - The CBR is the ratio of the resistance to penetration developed by a soil to that developed by a standard crushed-rock base material. The procedures used for calculating the field CBR values are as outlined in the U.S. Army Corps of Engineers Technical Manual (TM) 5-30, pages 2-86 to 2-96.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION		SURFICIAL GEOLOGIC UNIT	DEPTH		USCS	GRAIN SIZE DISTRIBUTION AND PLASTICITY					IN SITU DRY UNIT WEIGHT		MOISTURE CONTENT (%)	ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AVE[illegible] FIEL[illegible]
	FEET	METERS		FEET	METERS		GR	SA	FI	LL	PI	(pcf)	(kg m3)			
PI-F-1	5760	1756	A5i	1.0	0.30	SM	14	69	17			92.2	1477	7.7	72	[illegible]
PI-F-2	5185	1580	A5y	1.0	0.30	ML	0	10	90	35	9	70.4	1128	16.7	66	[illegible]
				2.0	0.61	ML	0	36	64			72.6	1163	17.1	63	[illegible]
PI-F-3	5230	1594	A5i/A1	1.0	0.30	CL-ML	0	7	93	28	7	69.3	1110	19.4	61	[illegible]
				2.0	0.61	CL-ML	0	13	87	27	6	69.5	1113	17.1	61	[illegible]
PI-F-4	5350	1631	A3/A5y	1.0	0.30	SM	0	77	23			100.3	1607	6.9	79	[illegible]
				2.0	0.61	SM	13	61	26			92.0	1474	8.6	72	[illegible]
PI-F-5	5230	1594	A3	1.0	0.30	SM	0	81	19			99.2	1589	6.0	80	[illegible]
				2.0	0.61	SP-SM	0	88	12			94.9	1520	6.4	76	[illegible]
PI-F-6	5200	1585	A5i	1.0	0.30	SM	16	62	22			92.4	1480	4.4	73	[illegible]
				2.0	0.61	SM	7	71	22			98.3	1575	6.1	77	[illegible]
PI-F-7	5170	1576	A40	1.0	0.30	CL	0	39	61	42	21	84.6	1355	22.9	74	[illegible]
				2.0	0.61	ML	0	47	53		NP	91.2	1461	15.4	79	[illegible]
PI-F-8	5275	1603	A5y	1.0	0.30	SM	5	67	28			87.9	1408	7.5	69	[illegible]
				2.0	0.61	SM	0	70	30			96.1	1540	6.5	76	[illegible]
PI-F-9	5550	1692	A5i	1.0	0.30	SM	17	56	27			97.4	1560	7.1	76	[illegible]
						SM	13	63	24			102.8	1647	8.2	80	[illegible]
PI-F-10	5330	1625	A5i	1.0	0.30	SM	7	68	25			100.6	1612	11.0	84	[illegible]
PI-F-11	5445	1660	A5i	1.0	0.30	SM	9	61	30			92.5	1482	8.9	73	[illegible]
PI-F-12	6320	1926	A5i	1.0	0.30	SM	0	69	31			95.2	1525	9.4	75	[illegible]
				2.0	0.61	SM	0	71	29			99.6	1596	8.4	78	[illegible]
				3.0	0.91	SM						98.6	1580	9.5	77	[illegible]
PI-F-13	5820	1774	A5i	1.0	0.30	SP-SM	33	59	8			85.7	1373	1.2	68	[illegible]
PI-F-14	6620	2013	A5i	1.0	0.30	SM	2	52	46	42	16	86.1	1379	15.0	75	[illegible]

IMATED ENT OF [illegible] DRY NSITY	AVERAGE FIELD CBR (%)	REMARKS
72	3	Maximum dry density from (PI-T-3)
66	8	
63	6	Maximum dry density from (PI-F-7), stage I caliche, slightly cemented
61	12	Maximum dry density from (PI-P-20)
61	13	
79	4	
72	14	Maximum dry density from (PI-T-3), soil consistency loose
80	7	
76	3	Soil consistency loose
73	3	Maximum dry density from (PI-T-3), soil consistency very loose
77	3	
74	10	
79	11	Inconsistent soils ranging from sandy silt to sand
69	5	Maximum dry density from (PI-T-5), soil consistency loose
76	7	
76	3	
80	5	Large gravel in field density hole
84	8	Maximum dry density from (PI-T-12)
73	6	
75	6	
78	5	
77	10	Moisture content from Speedy Moisture Meter Method
68	11	
75	6	

FIELD CBR TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE II-9-1
1 OF 2

FUGRO NATIONAL, INC.

AFV-22

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ACTIVITY NUMBER	GROUND SURFACE ELEVATION		SURFICIAL GEOLOGIC UNIT	DEPTH		USCS	GRAIN SIZE DISTRIBUTION AND PLASTICITY					IN SITU DRY UNIT WEIGHT		MOISTURE CONTENT (%)	ESTIMATED PERCENT OF MAXIMUM DRY DENSITY
	FEET	METERS		FEET	METERS		GR	SA	FI	LL	PI	(pcf)	(kg m3)		
PI-F 15	6500	1981	A50	1.0	0.30	SC	4	58	38	31	11	91.8	1471	7.7	80
				2.0	0.61	SC						86.6	1387	10.0	75
				3.0	0.91	SC	5	51	44	35	14	95.2	1525	10.1	83

ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AVERAGE FIELD CBR (%)	REMARKS
80	7	Maximum dry density from (PI-F-14)
75	5	Moisture content from Speedy Moisture Meter Method
83	3	

FIELD CBR TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE II-9-1
2 OF 2

FUGRO NATIONAL, INC.

AFV-22

2

10.0 CONE PENETROMETER TEST RESULTS

Explanation: The drawings in this section show the results of the cone penetrometer tests. The terms used in the drawing are defined below.

A. Depth - Corresponds to depth below ground surface.

B. Friction Resistance - The resistance to penetration developed by the friction sleeve, equal to the vertical force applied to the sleeve divided by its surface area. This resistance is the sum of friction and adhesion.

C. Cone Resistance - The resistance to penetration developed by the cone, equal to the vertical force applied to the cone divided by its horizontally projected area.

D. Friction Ratio - The ratio of friction resistance to cone resistance.

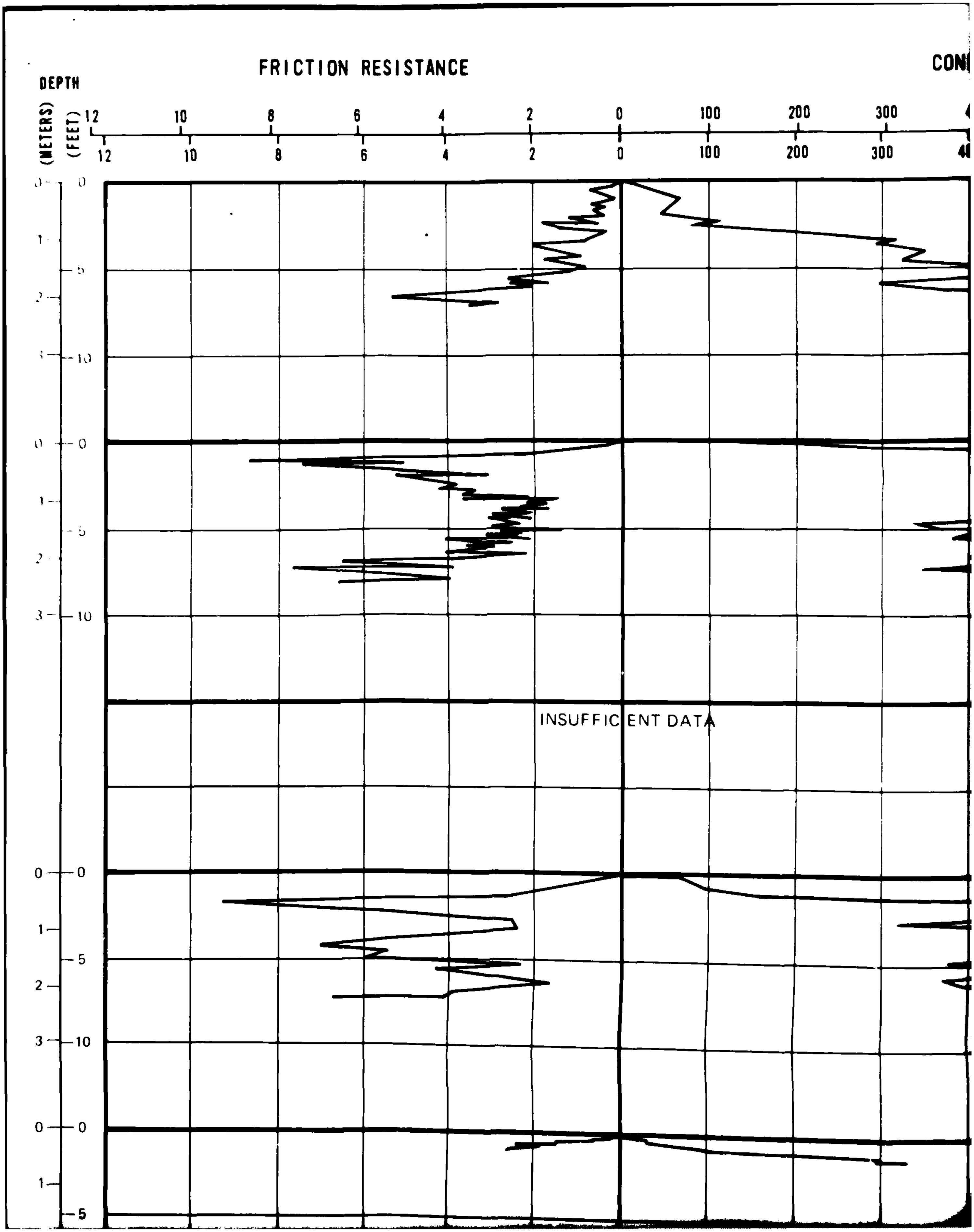
E. Designation - Each cone penetrometer test is identified by a number : for example C-1.

C - abbreviation for the CPT
1 - number of the test

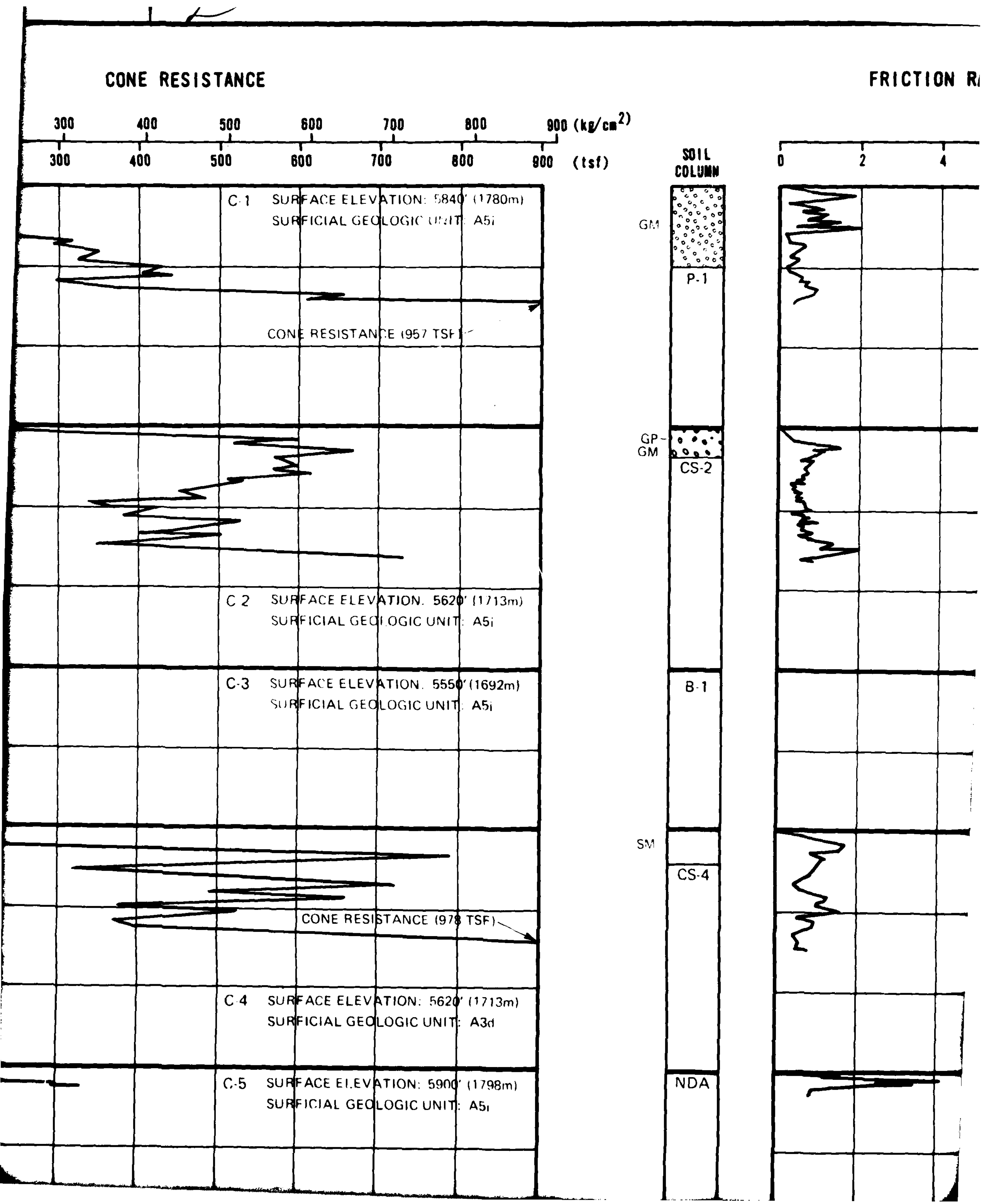
F. Surface Elevation - Indicated elevations on the drawings are estimated from topographic maps of the study area and are accurate within one-half the contour interval.

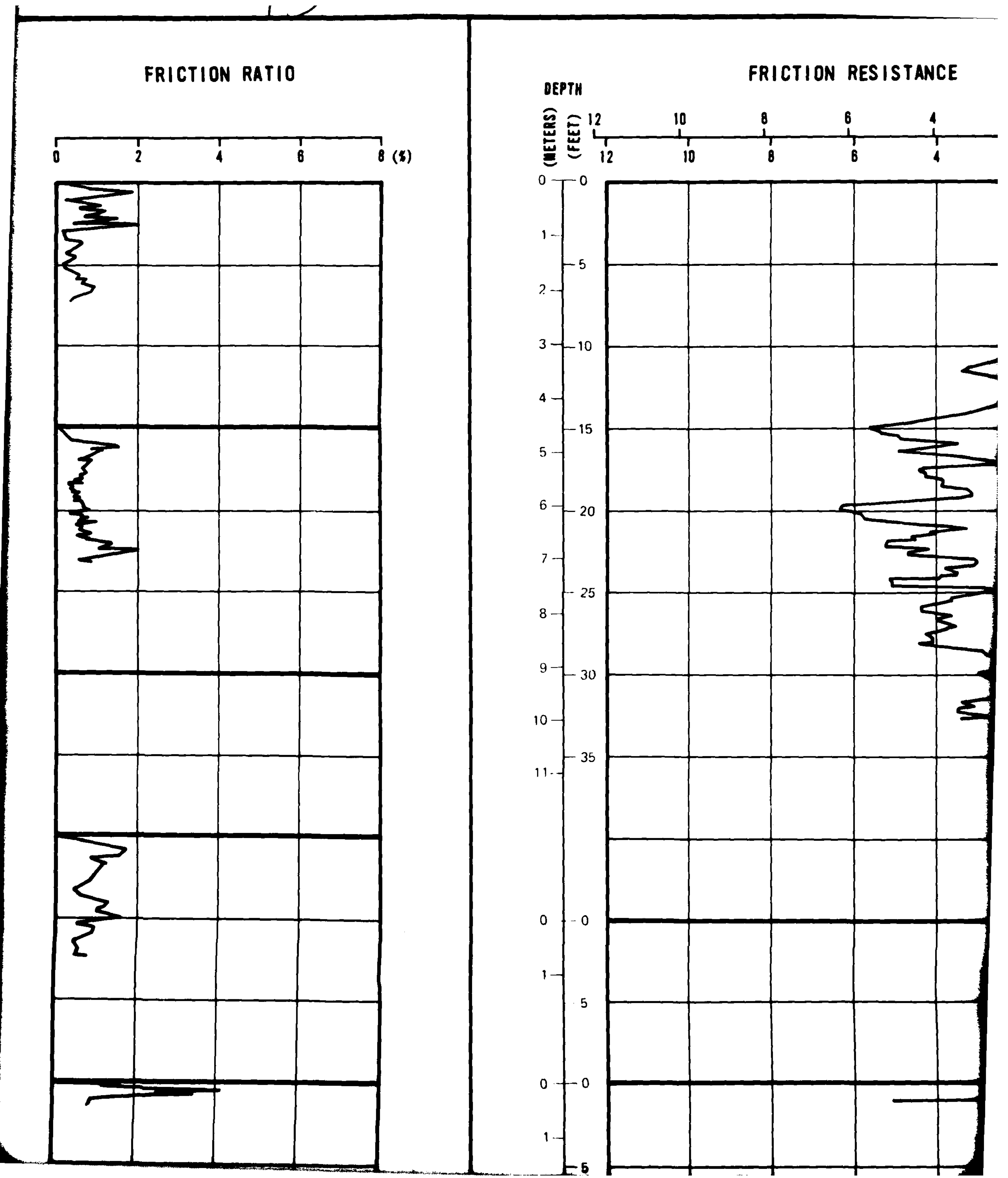
G. Surficial Geologic Unit - Indicates the surficial geologic unit in which the test was located.

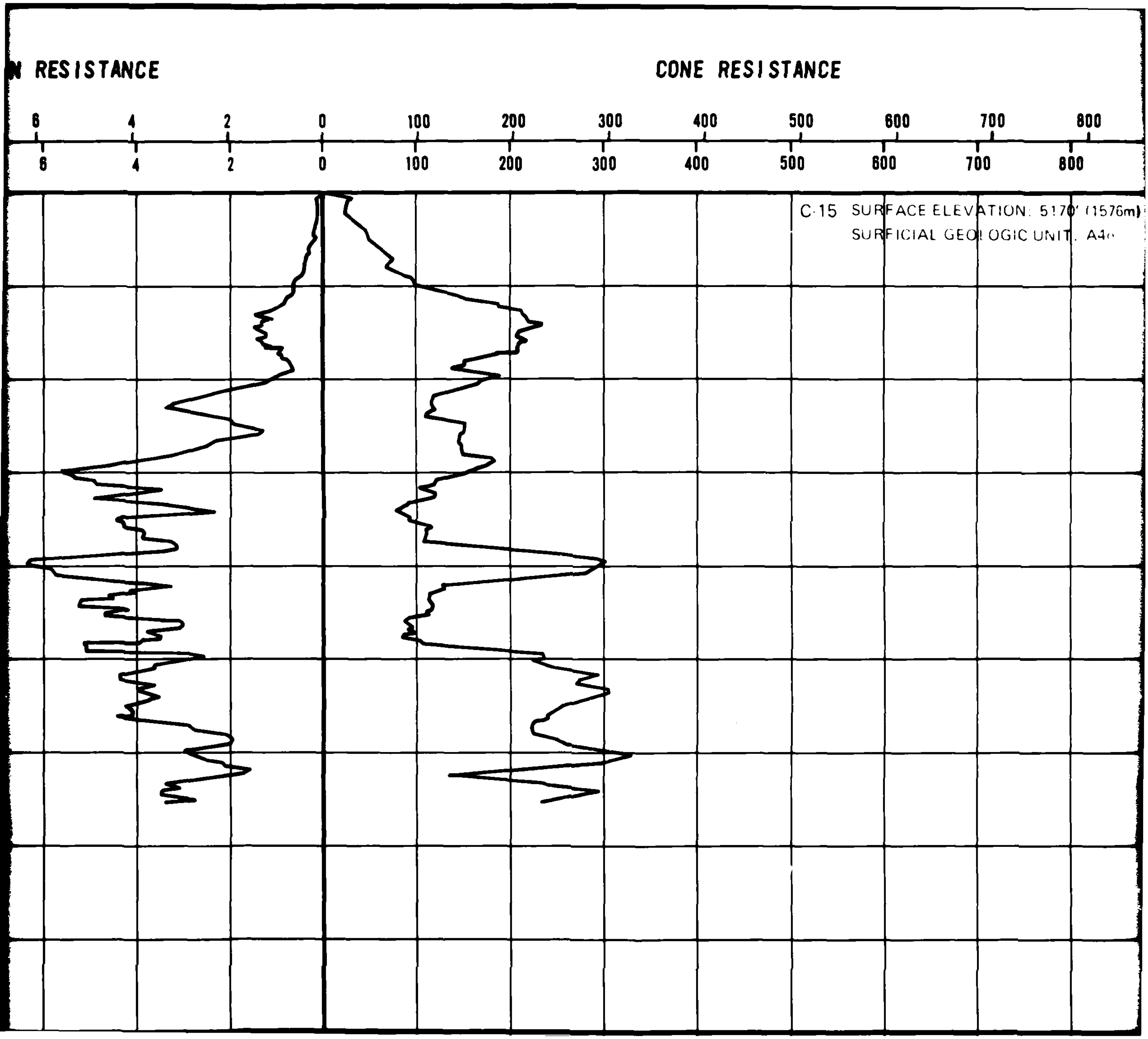
H. Soil Column - A graphical presentation of the soil type versus depth at each cone penetrometer test location. The Unified Soil Classification Symbol for each different soil type is listed immediately to the left of the soil column. Immediately below the soil column, the activity number for the corresponding boring, trench, test pit, or surficial soil sample at each CPT location is given.



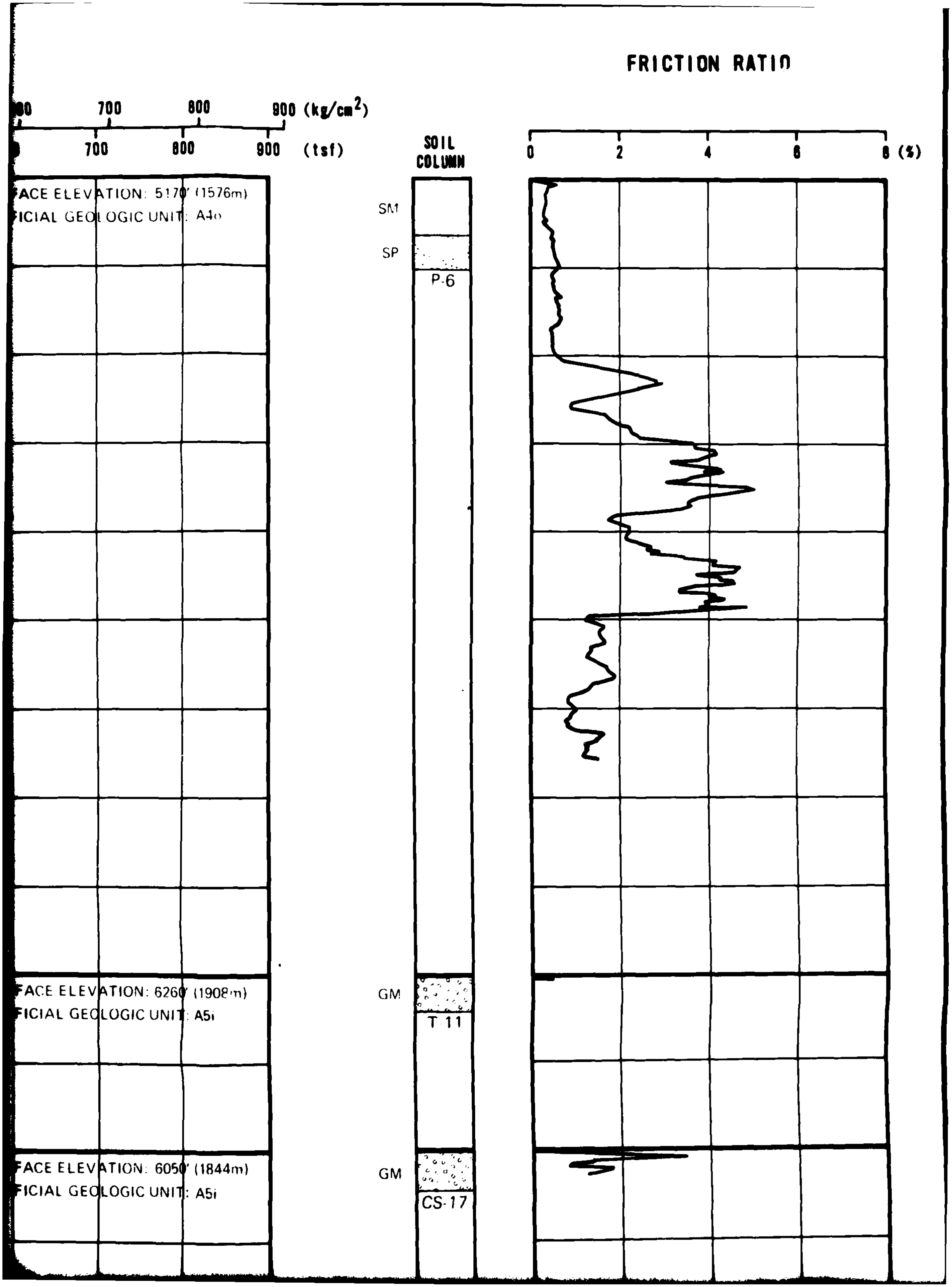
FRICTION RESISTANCE
CON
DEPTH
(METERS)
(FEET)
12 10 8 6 4 2 0 100 200 300
INSUFFICIENT DATA


CONE RESISTANCE
FRICTION R
300 400 500 600 700 800 900 (kg/cm2)
300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2 4
C-1 SURFACE ELEVATION: 5840' (1780m)
SURFICIAL GEOLOGIC UNIT: A5i
CONE RESISTANCE (957 TSF)
GM
P-1
GP-GM
CS-2
C-2 SURFACE ELEVATION. 5620' (1713m)
SURFICIAL GEOLOGIC UNIT: A5i
C-3 SURFACE ELEVATION. 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5i
B-1
SM
CS-4
CONE RESISTANCE (978 TSF)
C-4 SURFACE ELEVATION: 5620' (1713m)
SURFICIAL GEOLOGIC UNIT: A3d
C-5 SURFACE ELEVATION: 5900' (1798m)
SURFICIAL GEOLOGIC UNIT: A5i
NDA

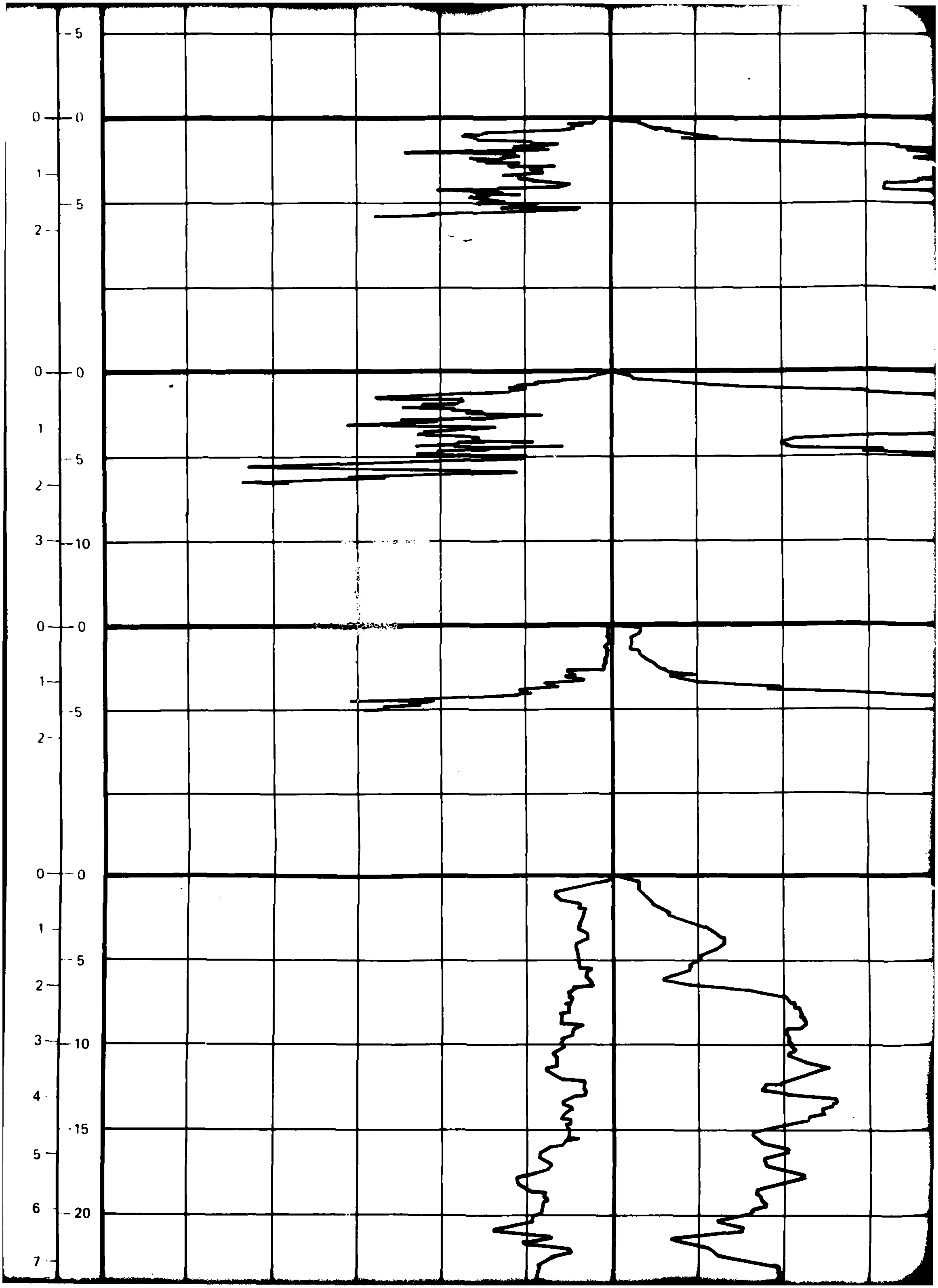

FRICTION RATIO
0
2
4
6
8 (%)
DEPTH
(METERS)
(FEET)
FRICTION RESISTANCE
12
10
8
6
4
0
1
2
3
4
5
6
7
8
9
10
11
0
5
10
15
20
25
30
35



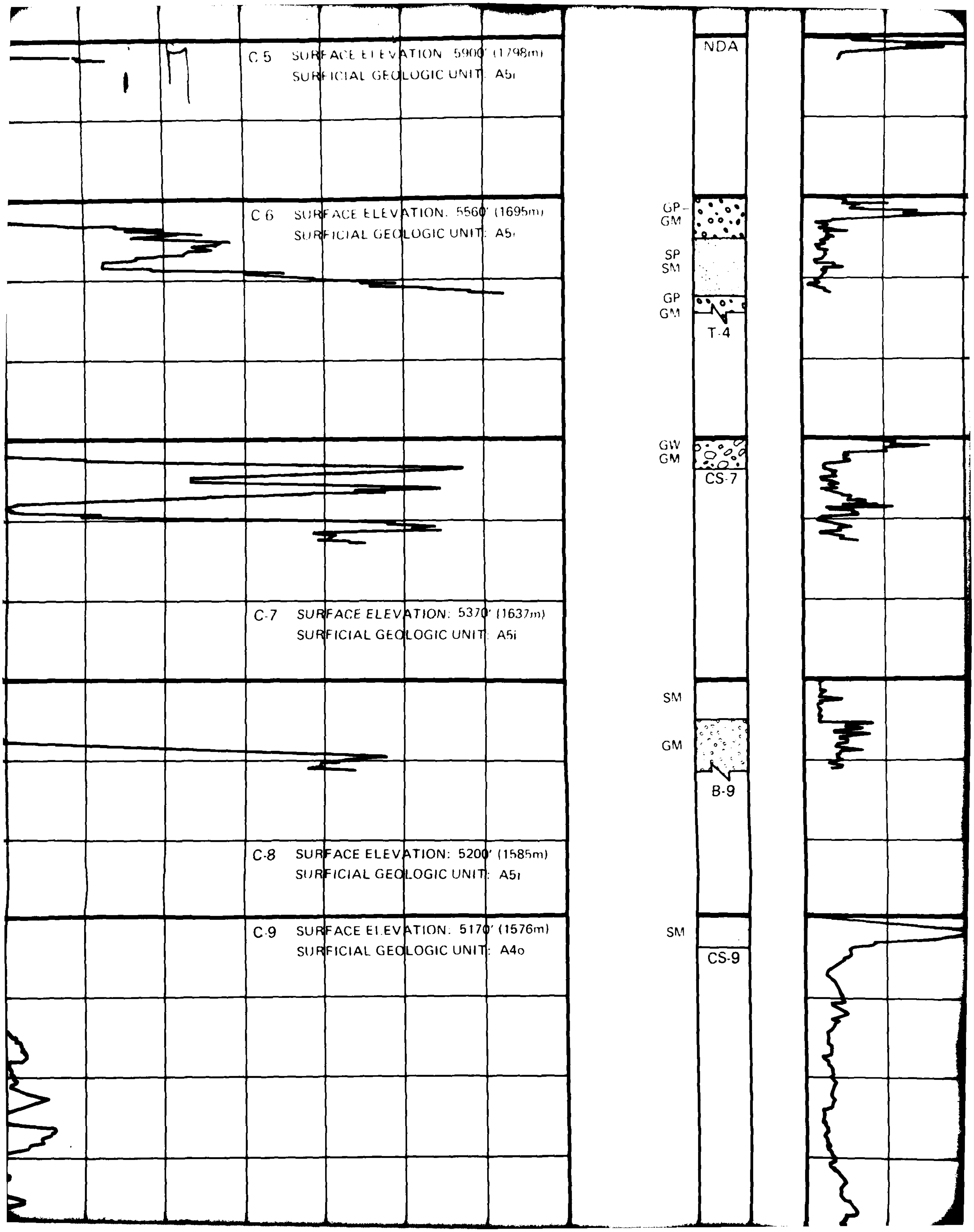
N RESISTANCE
CONE RESISTANCE
6 4 2 0 100 200 300 400 500 600 700 800
6 4 2 0 100 200 300 400 500 600 700 800
C-15 SURFACE ELEVATION: 5170' (1576m)
SURFICIAL GEOLOGIC UNIT: A4c

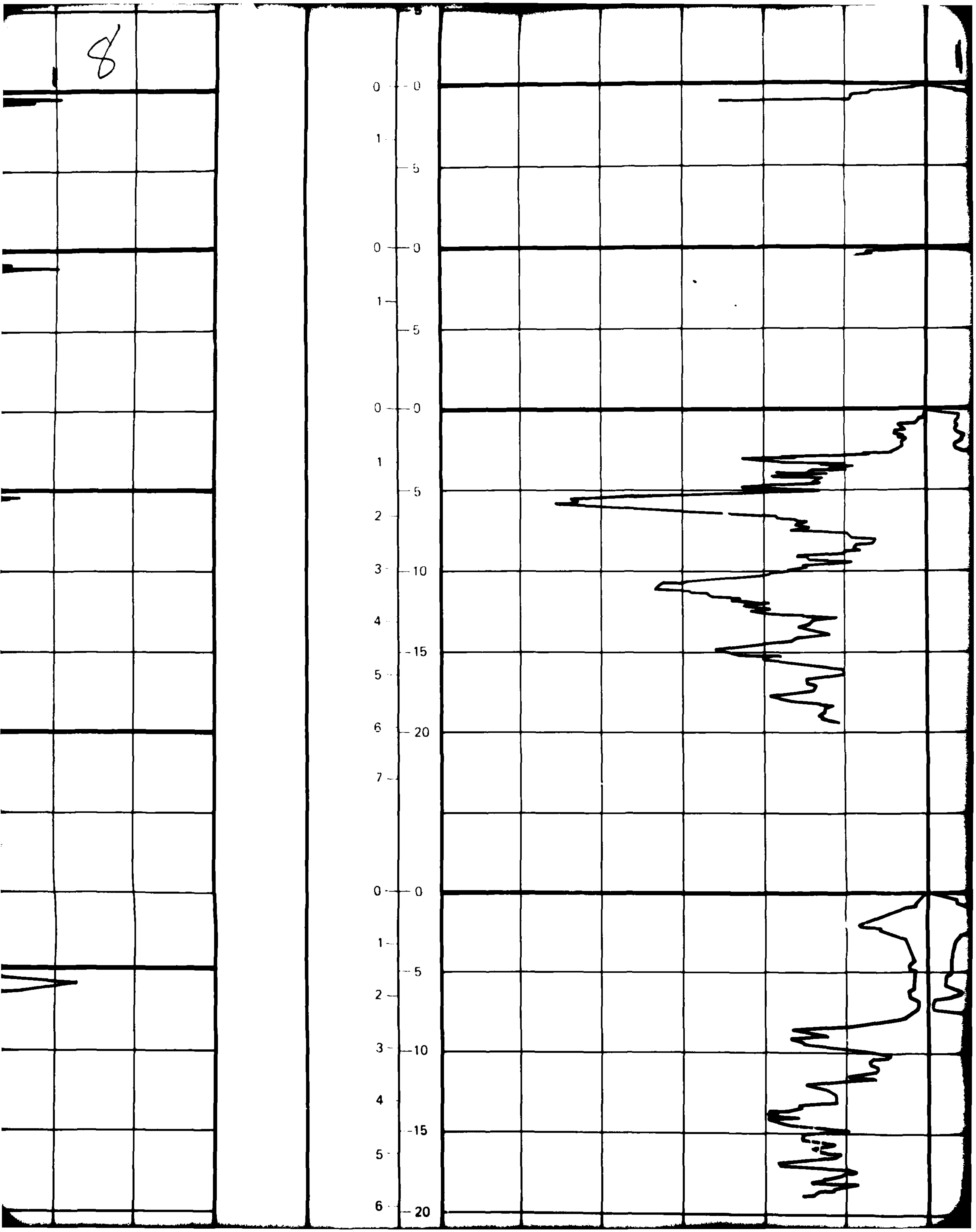


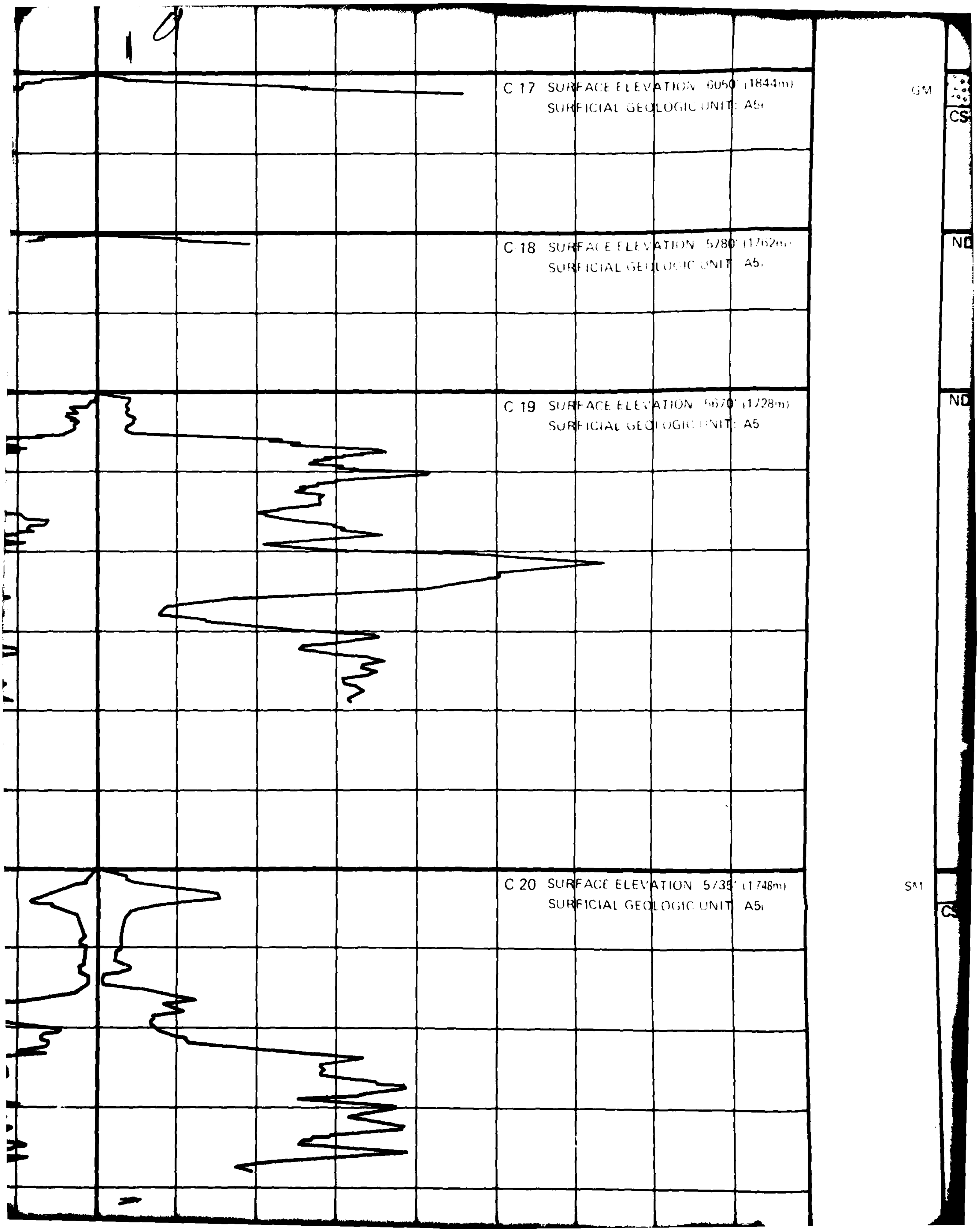
FRICTION RATIO
700
800
900 (kg/cm2)
700
800
900 (tsf)
SOIL COLUMN
0
2
4
6
8 (%)
FACE ELEVATION: 5170' (1576m)
FICIAL GEOLOGIC UNIT: A4o
SM
SP
P-6
FACE ELEVATION: 6260' (1908m)
FICIAL GEOLOGIC UNIT: A5i
GM
T-11
FACE ELEVATION: 6050' (1844m)
FICIAL GEOLOGIC UNIT: A5i
GM
CS-17



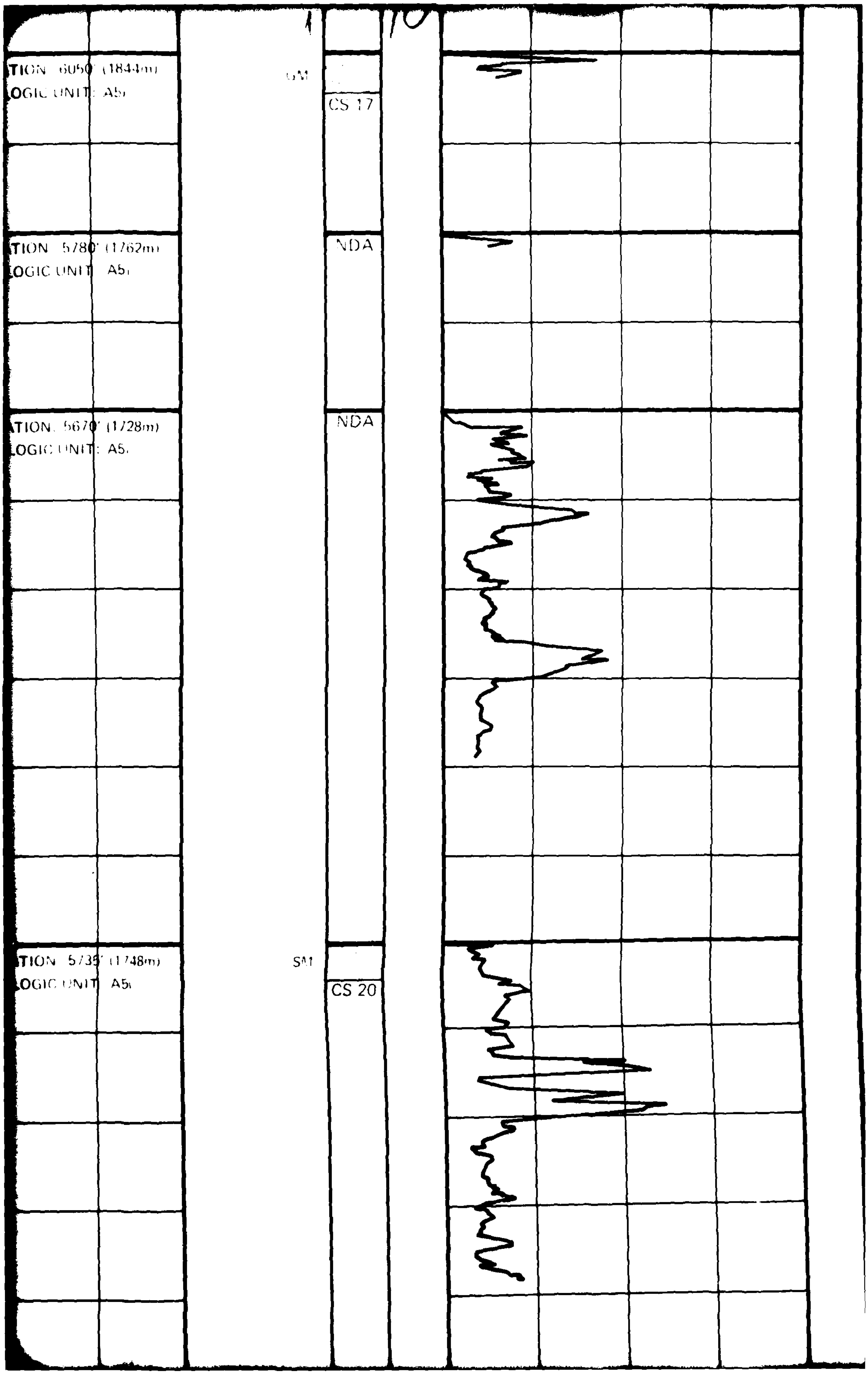
5
0 0
1
5
2
0 0
1
5
2
3 10
0 0
1
5
2
0 0
1
5
2
3 10
4
15
5
6 20
7

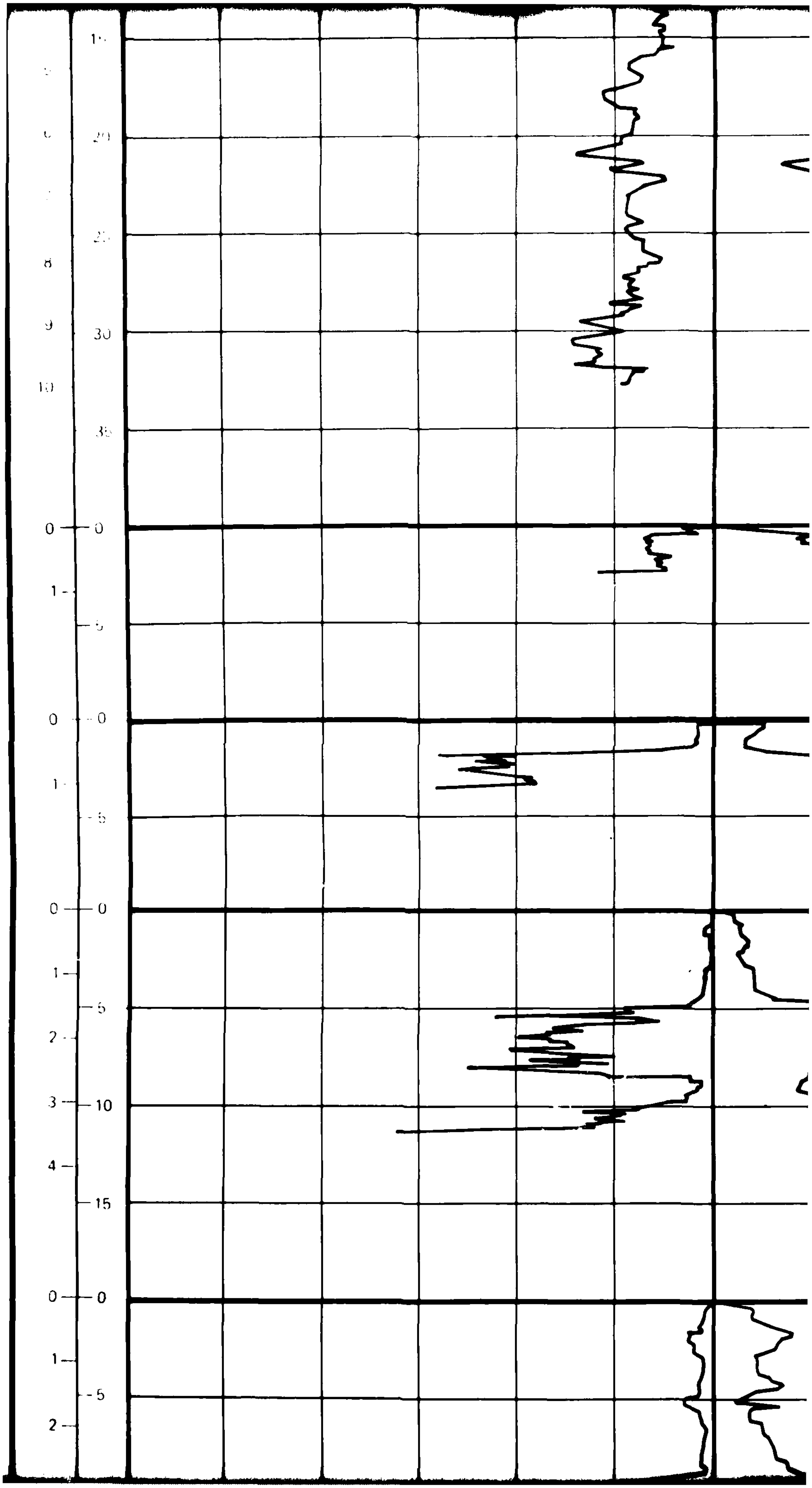

C-5 SURFACE ELEVATION: 5900' (1798m)
SURFICIAL GEOLOGIC UNIT: A5i
NDA
C-6 SURFACE ELEVATION: 5560' (1695m)
SURFICIAL GEOLOGIC UNIT: A5i
GP-GM
SP SM
GP GM
T-4
GW GM
CS-7
C-7 SURFACE ELEVATION: 5370' (1637m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
GM
B-9
C-8 SURFACE ELEVATION: 5200' (1585m)
SURFICIAL GEOLOGIC UNIT: A5i
C-9 SURFACE ELEVATION: 5170' (1576m)
SURFICIAL GEOLOGIC UNIT: A4o
SM
CS-9


8
0 0
1 5
0 0
1 5
0 0
1 2 3 4 5 6 7
5 10 15 20
0 0
1 2 3 4 5 6
5 10 15 20



10
C 17 SURFACE ELEVATION 6050' (1844m)
SURFICIAL GEOLOGIC UNIT: A5i
C 18 SURFACE ELEVATION 5780' (1762m)
SURFICIAL GEOLOGIC UNIT: A5i
C 19 SURFACE ELEVATION 5670' (1728m)
SURFICIAL GEOLOGIC UNIT: A5
C 20 SURFACE ELEVATION 5735' (1748m)
SURFICIAL GEOLOGIC UNIT: A5i
GM
CS
ND
ND
SM
CS


TION 6050' (1844m)
OGIC UNIT: A5i
GM
CS 17
TION 5780' (1762m)
OGIC UNIT A5i
NDA
TION 5670' (1728m)
OGIC UNIT: A5i
NDA
TION 5735' (1748m)
OGIC UNIT A5i
SM
CS 20



8
9
30
10
0
0
1
5
0
0
1
5
0
0
1
5
2
3
10
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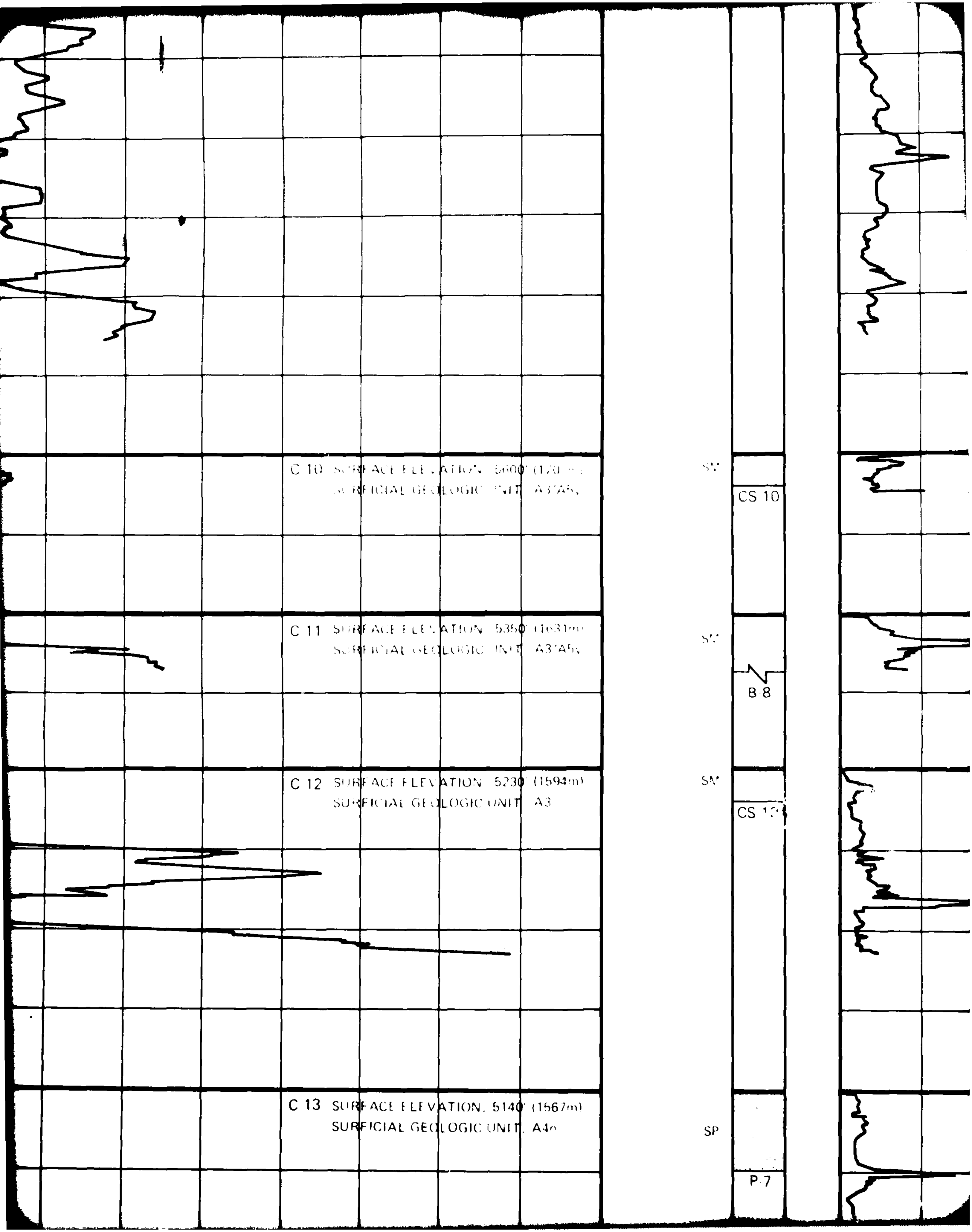
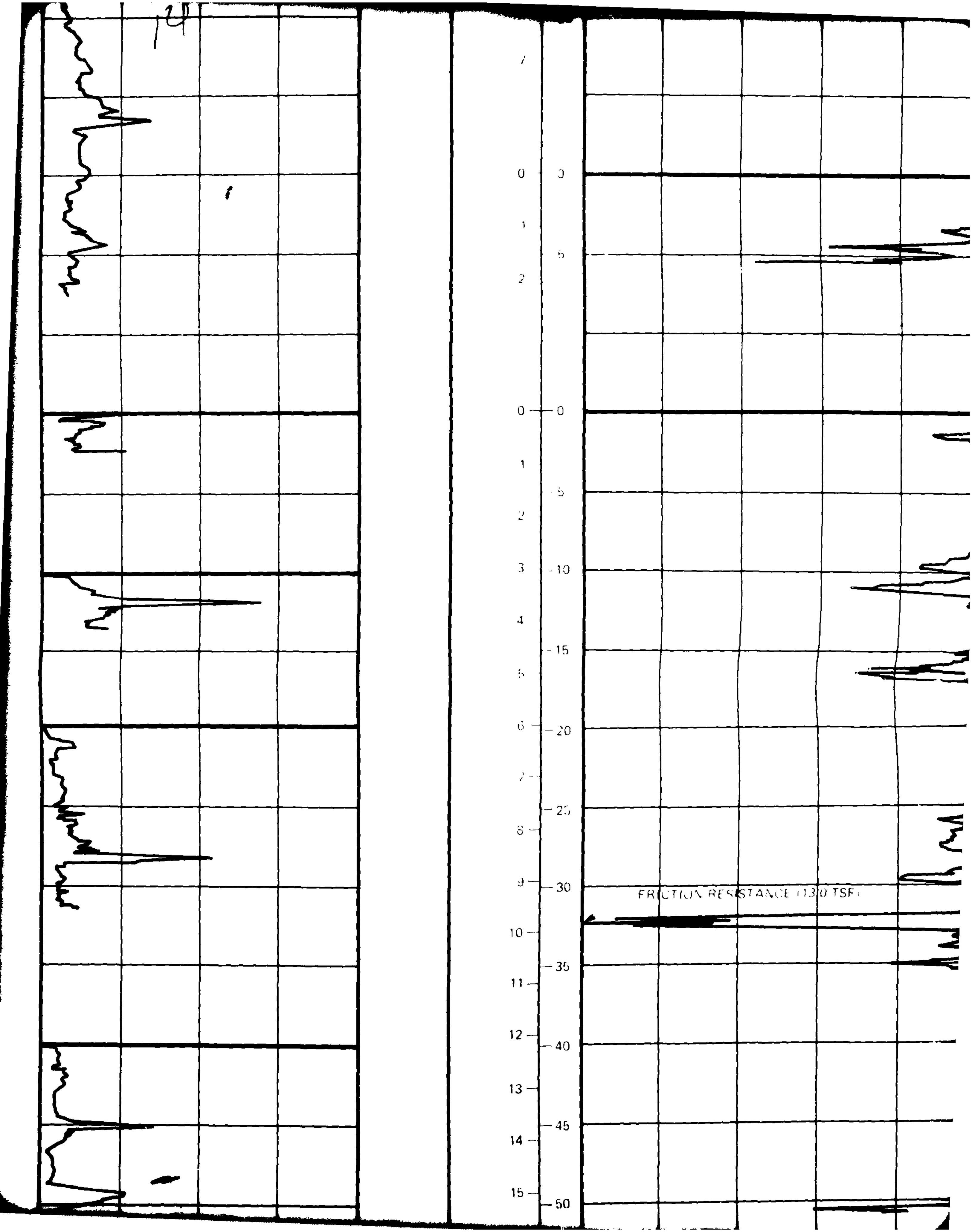
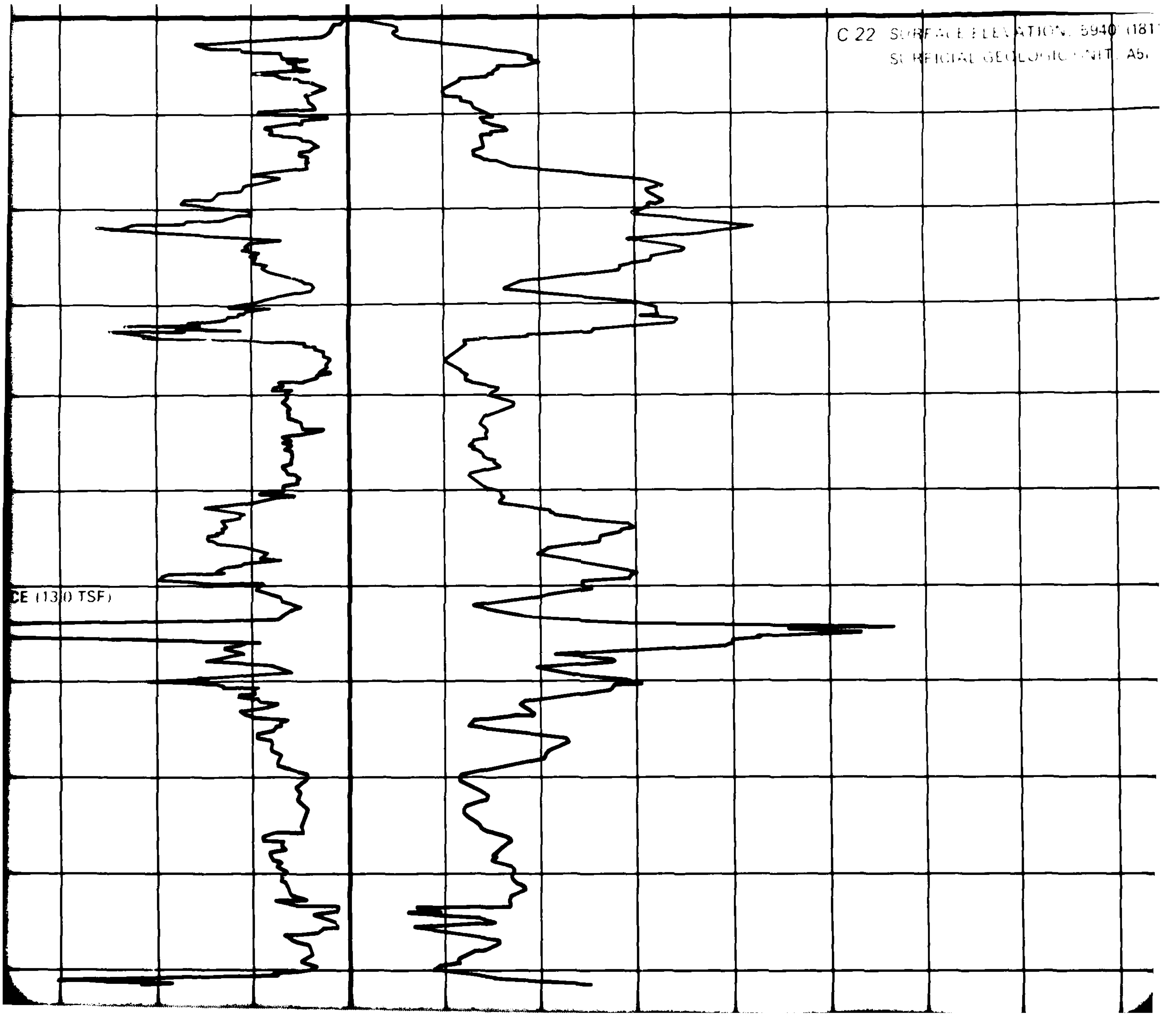
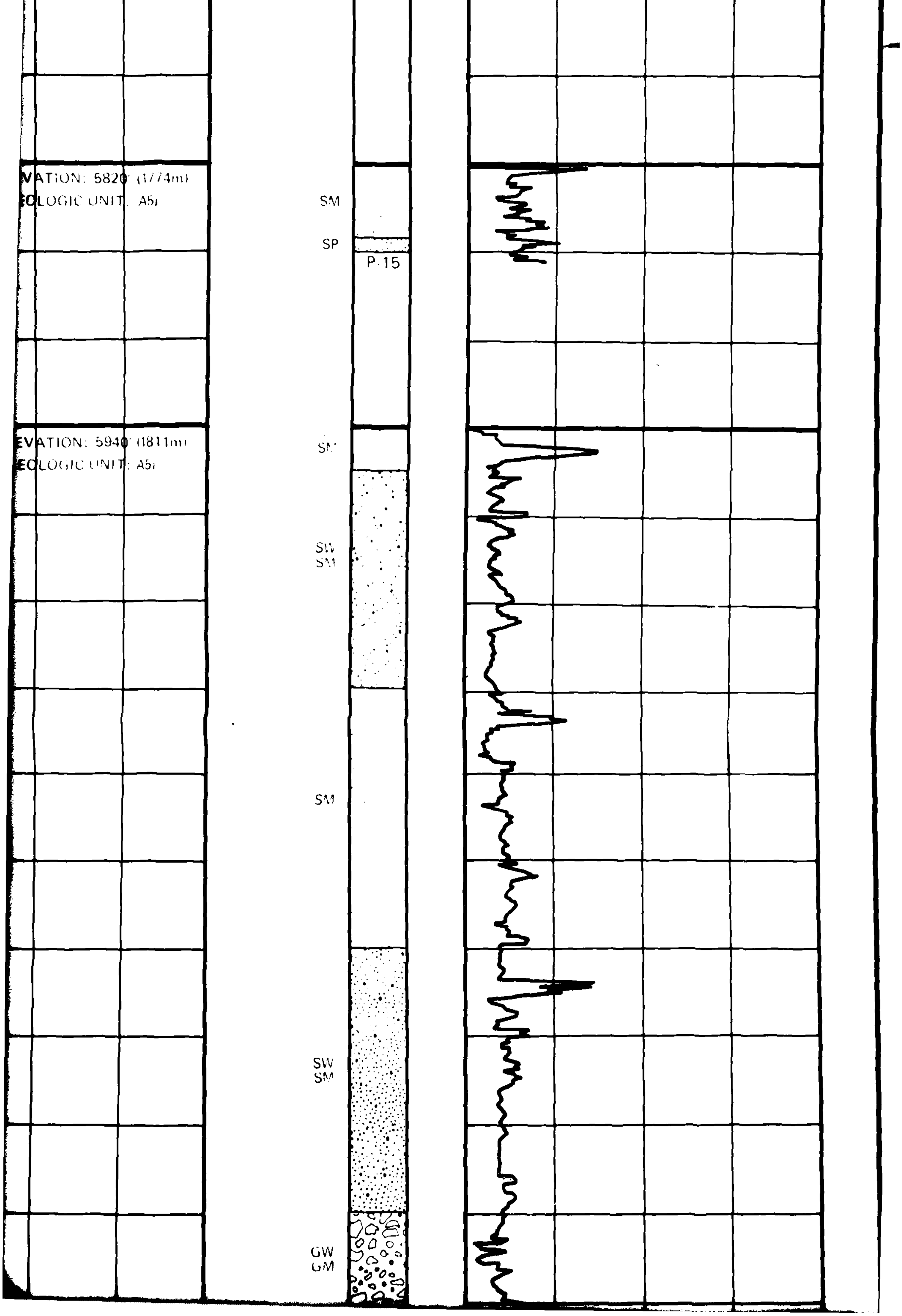
0
0
1
5
2

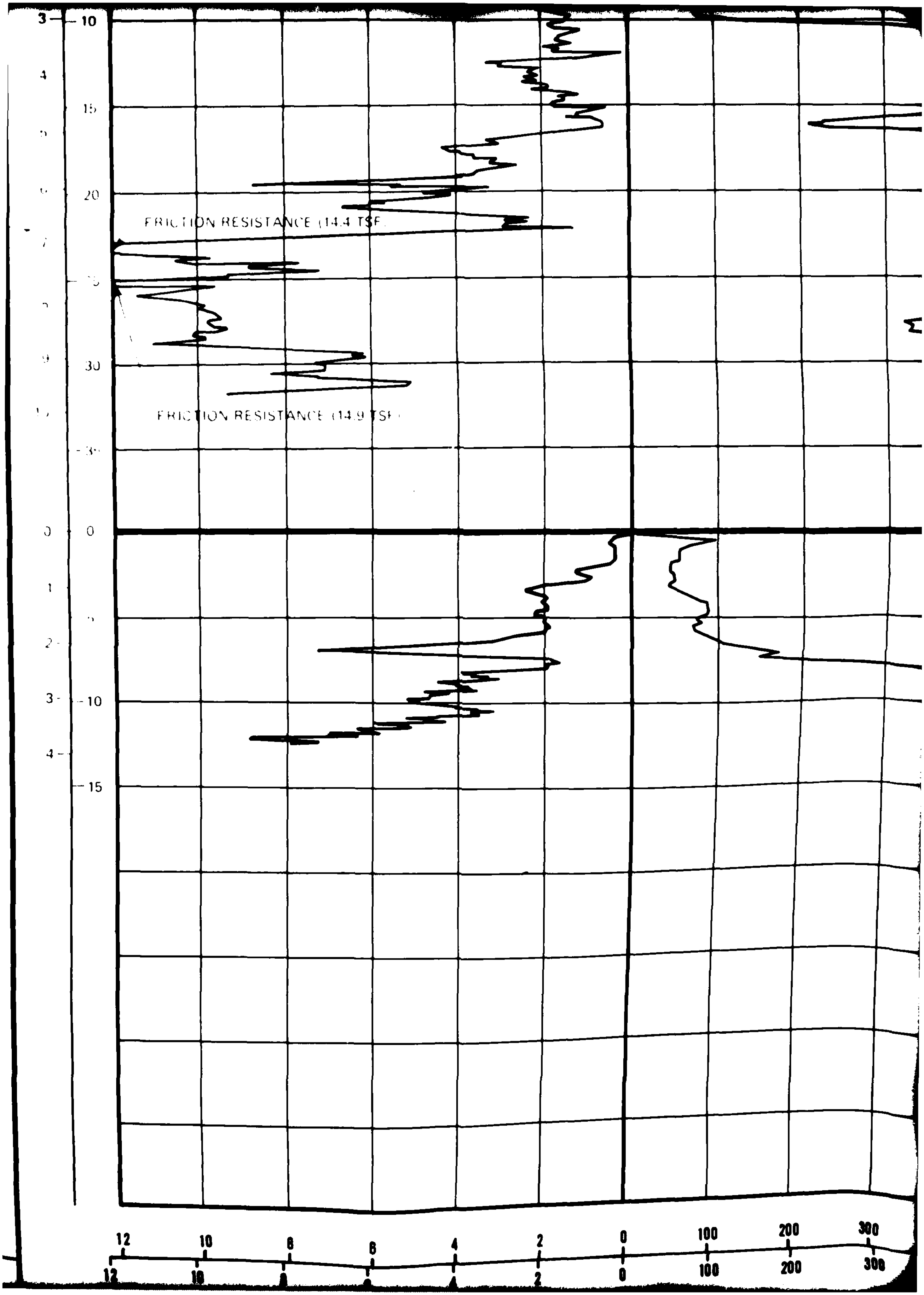

C 10 SURFACE ELEVATION: 5600'
SURFICIAL GEOLOGIC UNIT: A3/A5
SM
CS 10
C 11 SURFACE ELEVATION: 5350' (1631m)
SURFICIAL GEOLOGIC UNIT: A3/A5
SM
B-8
C 12 SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A3
SM
C 13 SURFACE ELEVATION: 5140' (1567m)
SURFICIAL GEOLOGIC UNIT: A4
SP
P-7

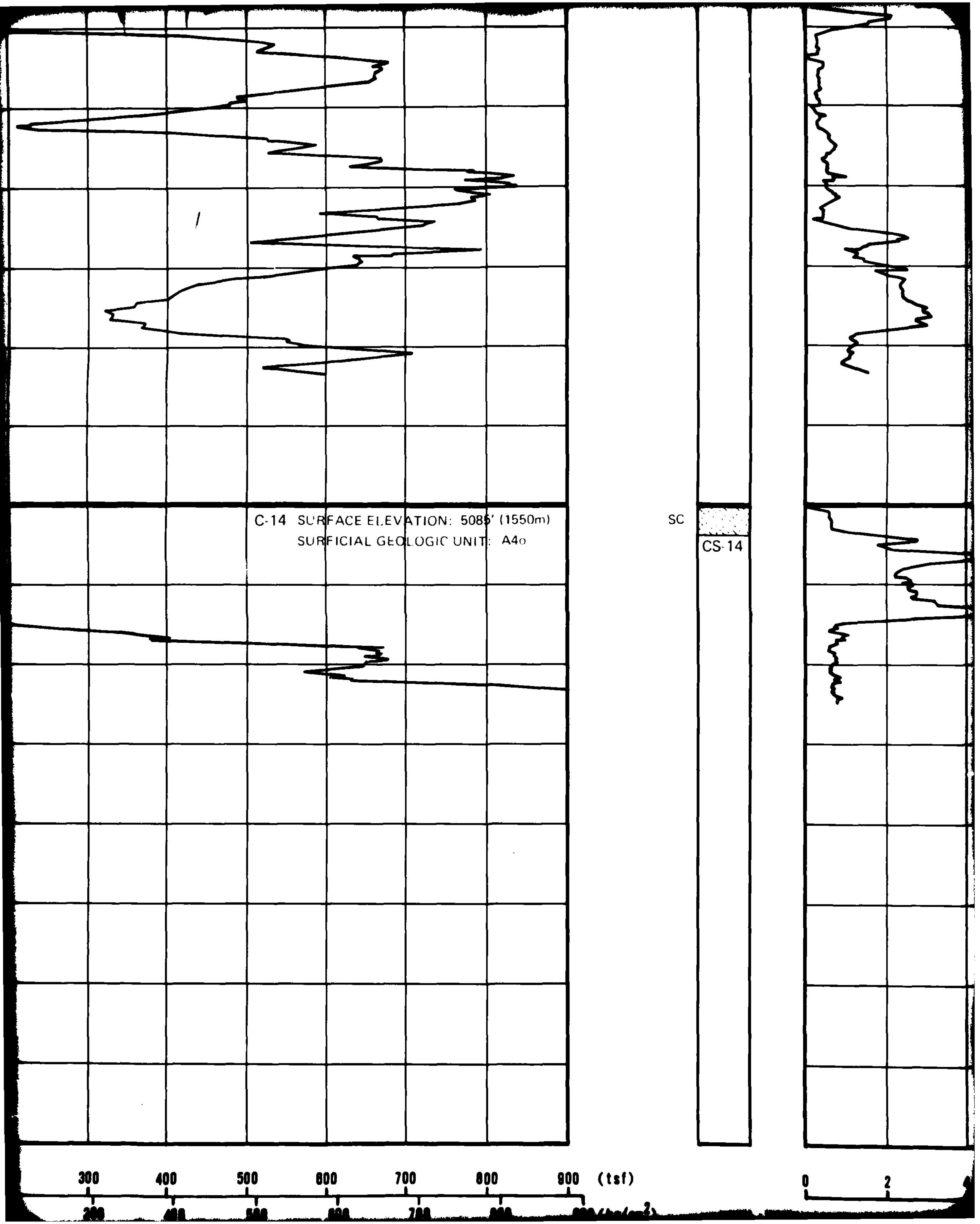

FRICTION RESISTANCE (13.0 TSF)

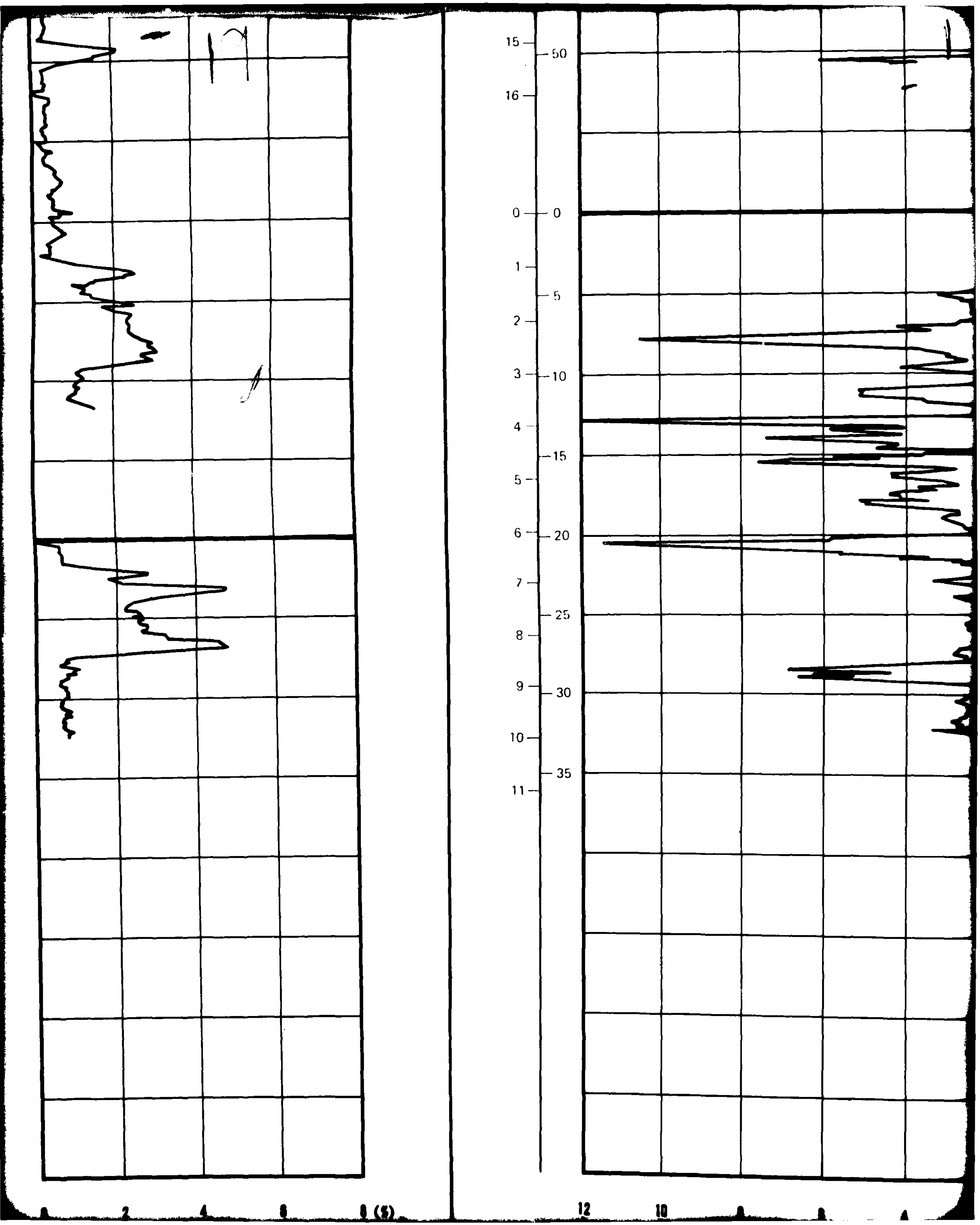

C 22 SURFACE ELEVATION: 5940' (181
SURFICIAL GEOLOGIC UNIT: A5
CE (13.0 TSF)

16

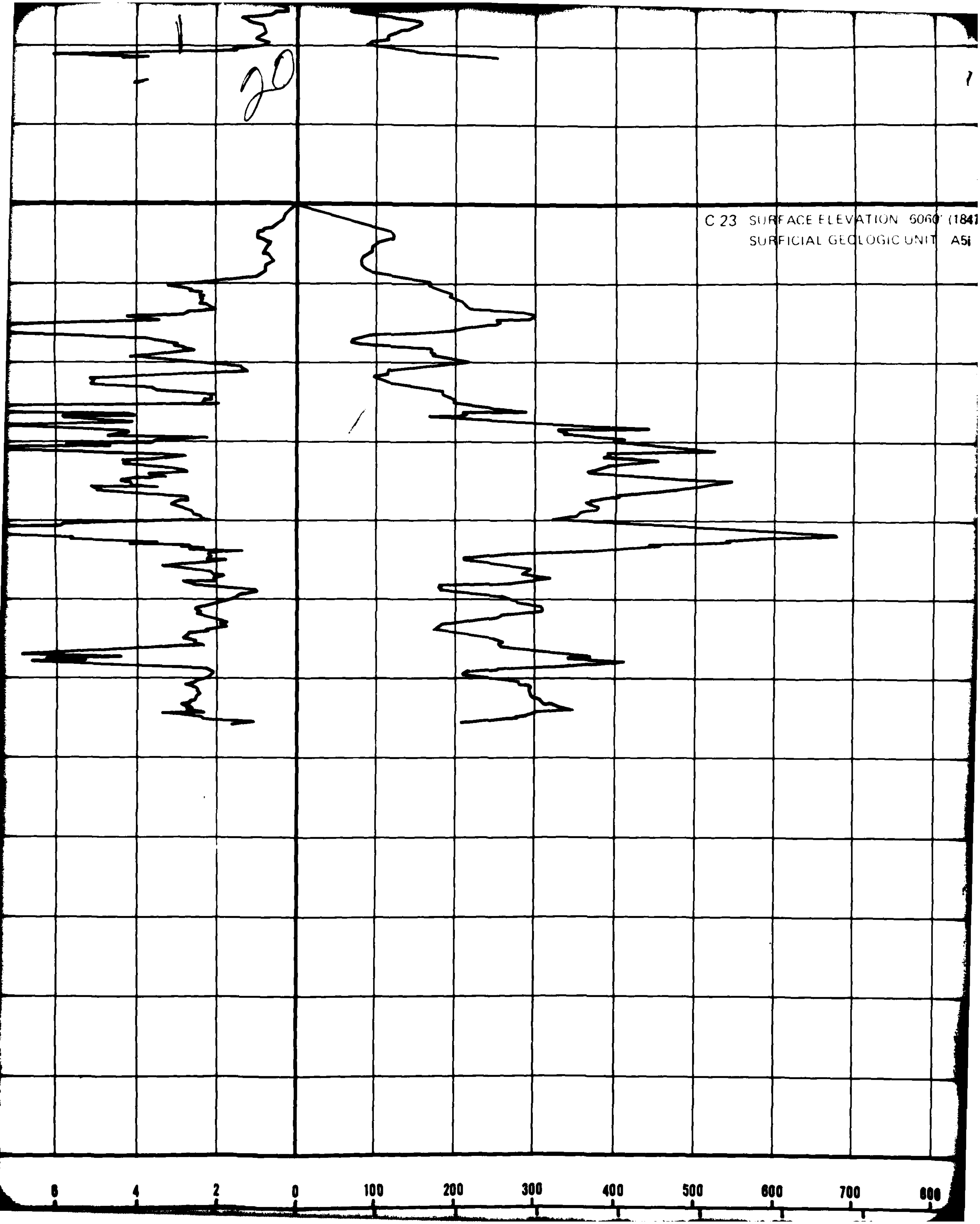

VATION: 5820' (1774m)
OLOGIC UNIT: A5i
SM
SP
P-15
EVATION: 5940' (1811m)
EOLOGIC UNIT: A5i
SM
SW
SM
SM
SW
SM
GW
GM

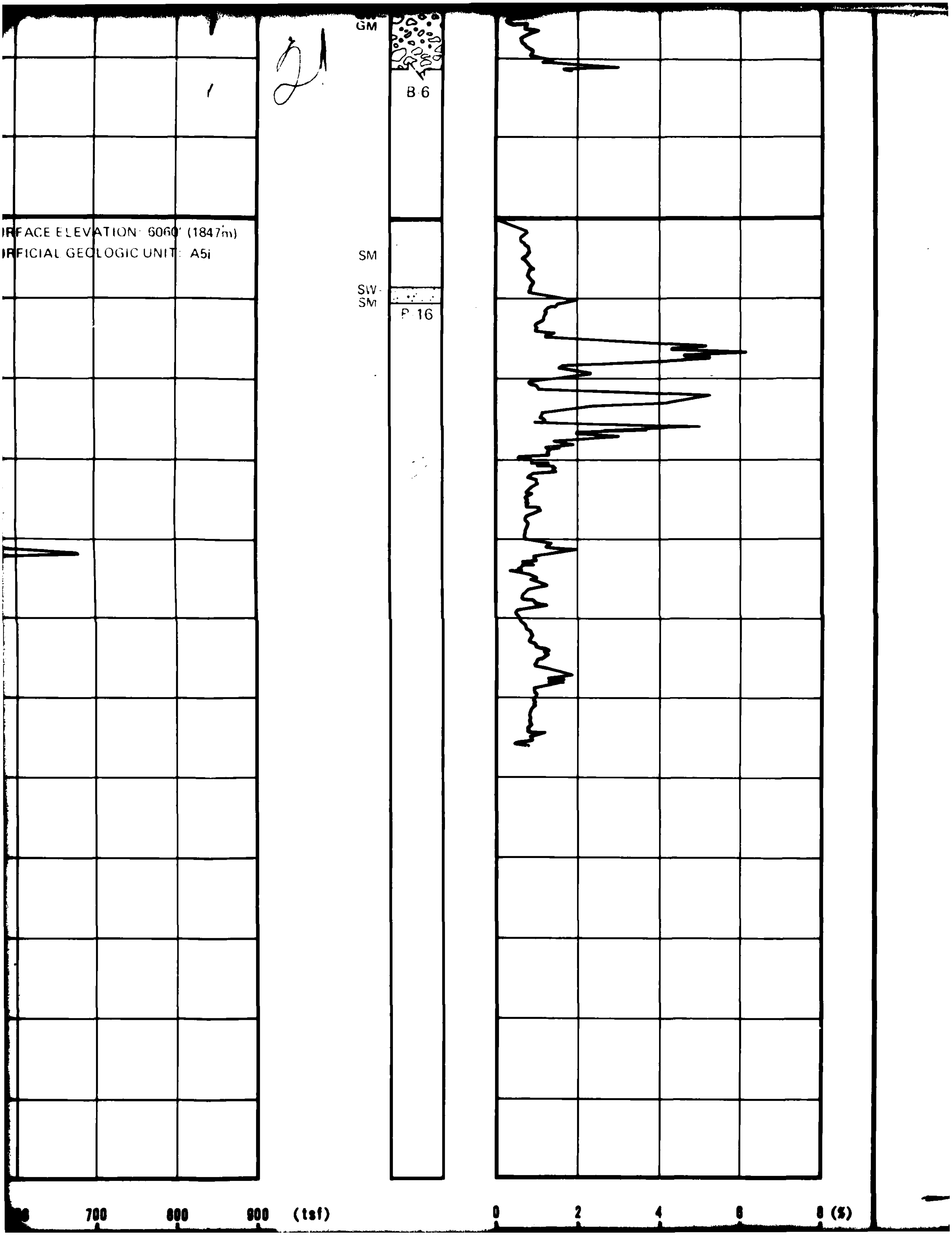

FRICTION RESISTANCE (14.4 TSF)
FRICTION RESISTANCE (14.9 TSF)
10
15
20
30
0
10
15
12
10
8
6
4
2
0
100
200
300


C-14 SURFACE ELEVATION: 5085' (1550m)
SURFICIAL GEOLOGIC UNIT: A4o
SC
CS-14
300 400 500 600 700 800 900 (tsf)
0 2 4

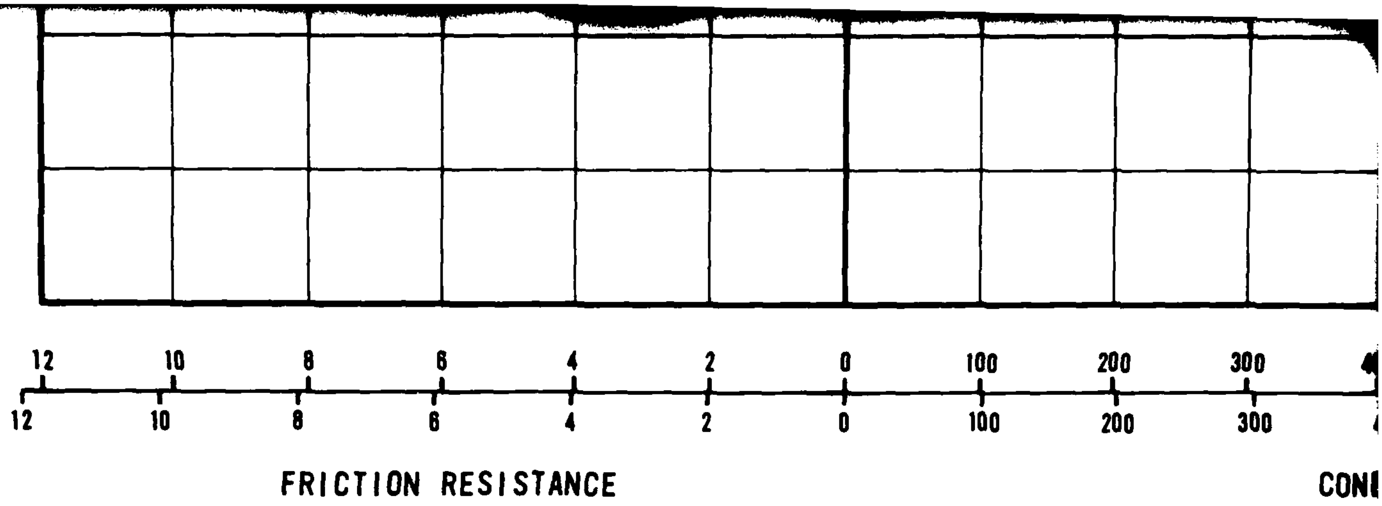


15
16
0
1
2
3
4
5
6
7
8
9
10
11
50
0
5
10
15
20
25
30
35
2
4
12
10


20
C 23 SURFACE ELEVATION 6060' (1847
SURFICIAL GEOLOGIC UNIT A5i
6
4
2
0
100
200
300
400
500
600
700
800

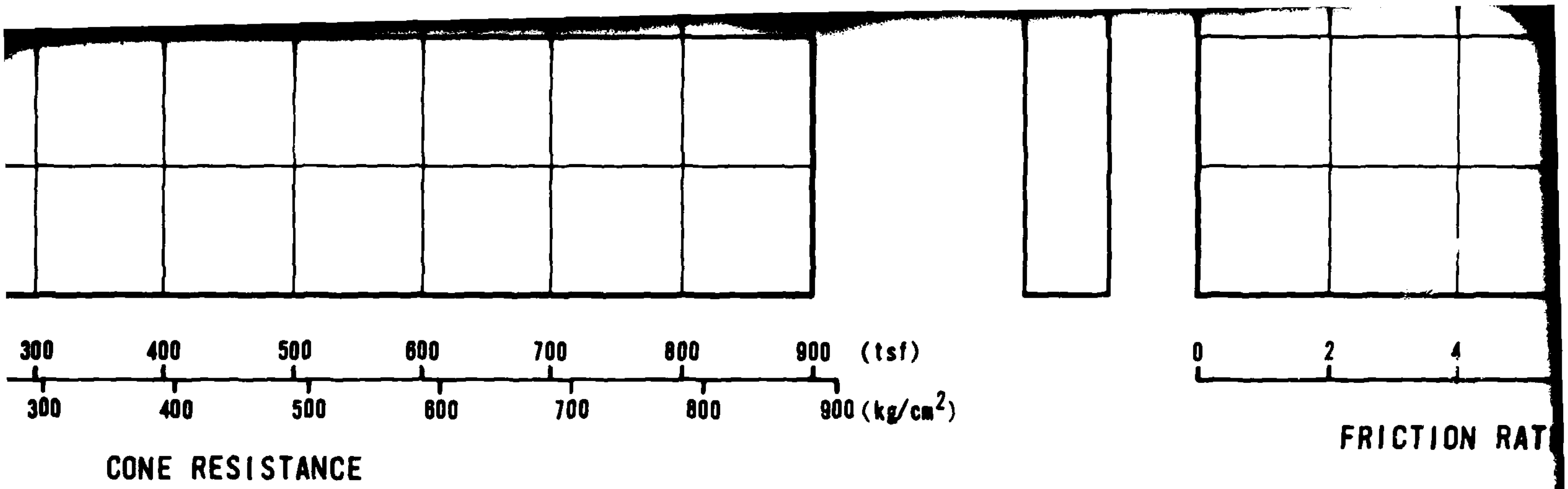


GM
B-6
RFACE ELEVATION: 6060' (1847m)
RFICIAL GEOLOGIC UNIT: A5i
SM
SW-SM
P-16
700
800
900
(tsf)
0
2
4
6
8
(%)



24 MAR 81

22


300 400 500 600 700 800 900 (tsf)
300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE
0 2 4
FRICTION RAT

23

1 24

4 2 0 100 200 300 400 500 600 700 800 900 (ts

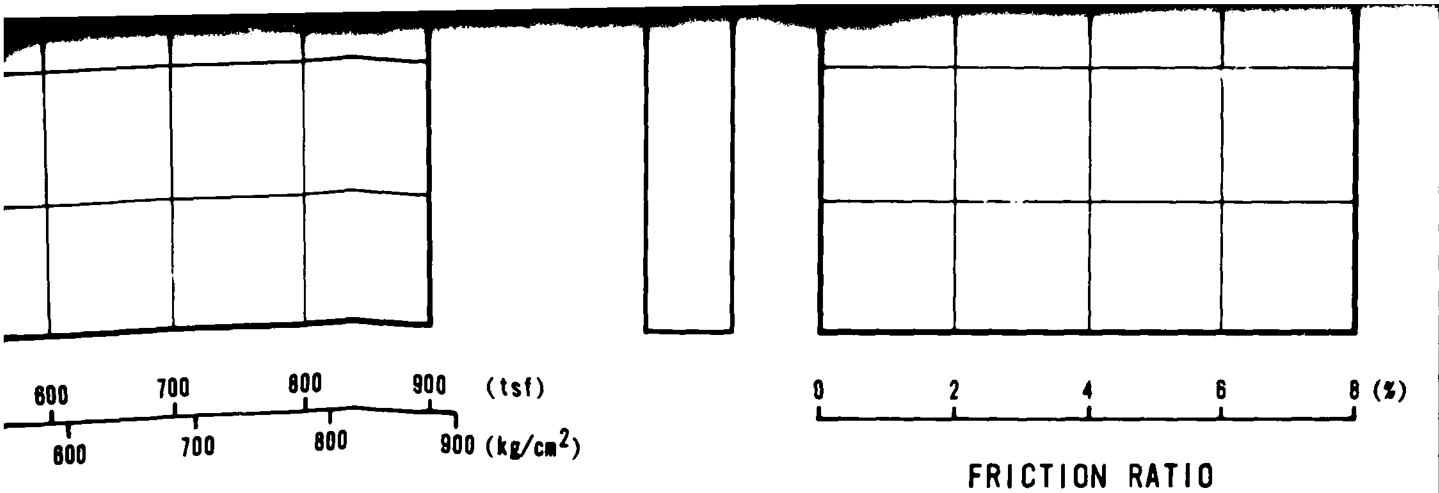
4 2 0 100 200 300 400 500 600 700 800 900 (kg

TANCE

CONE RESISTANCE

1

.25



CONE PENETROMETER TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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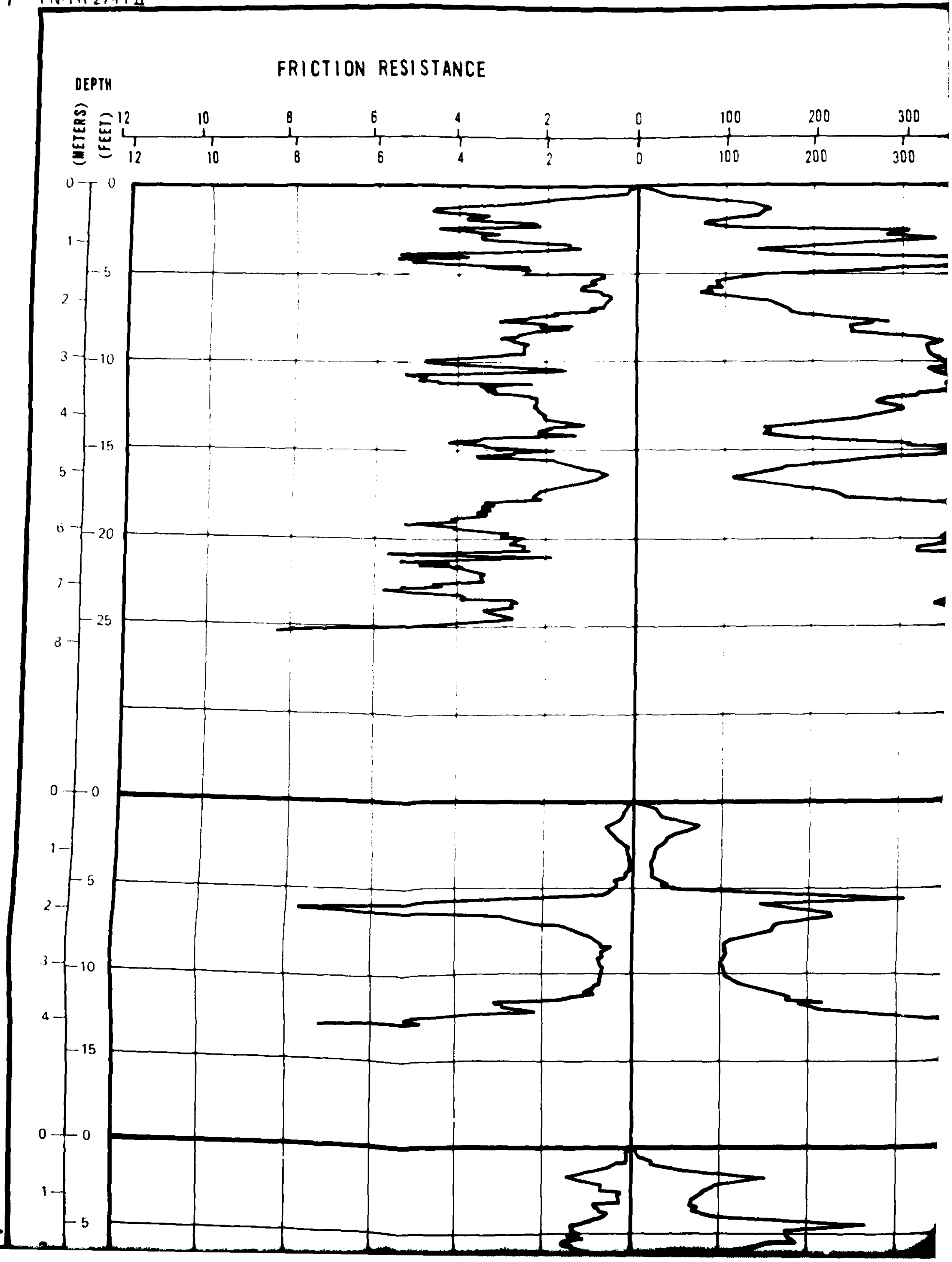
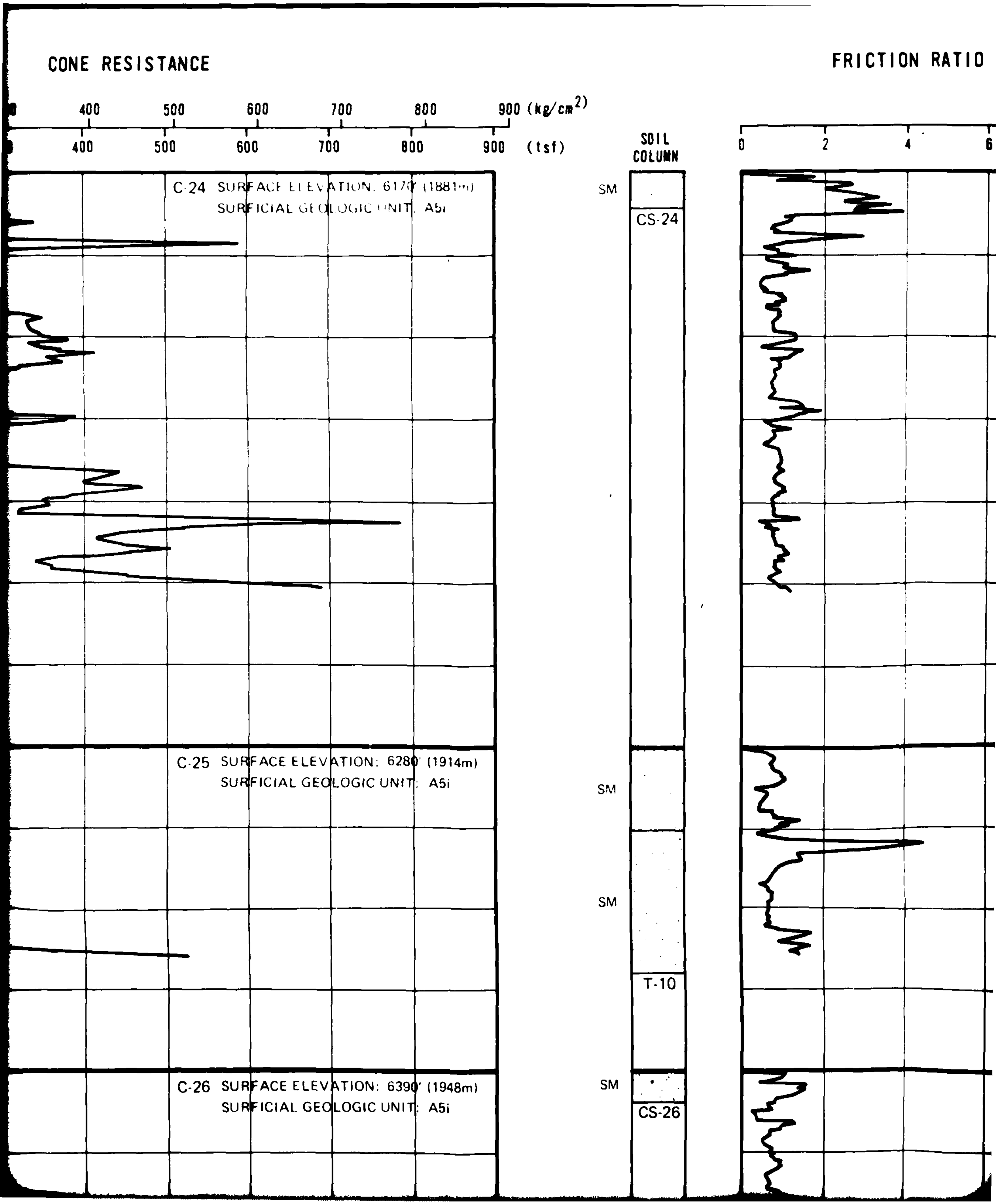
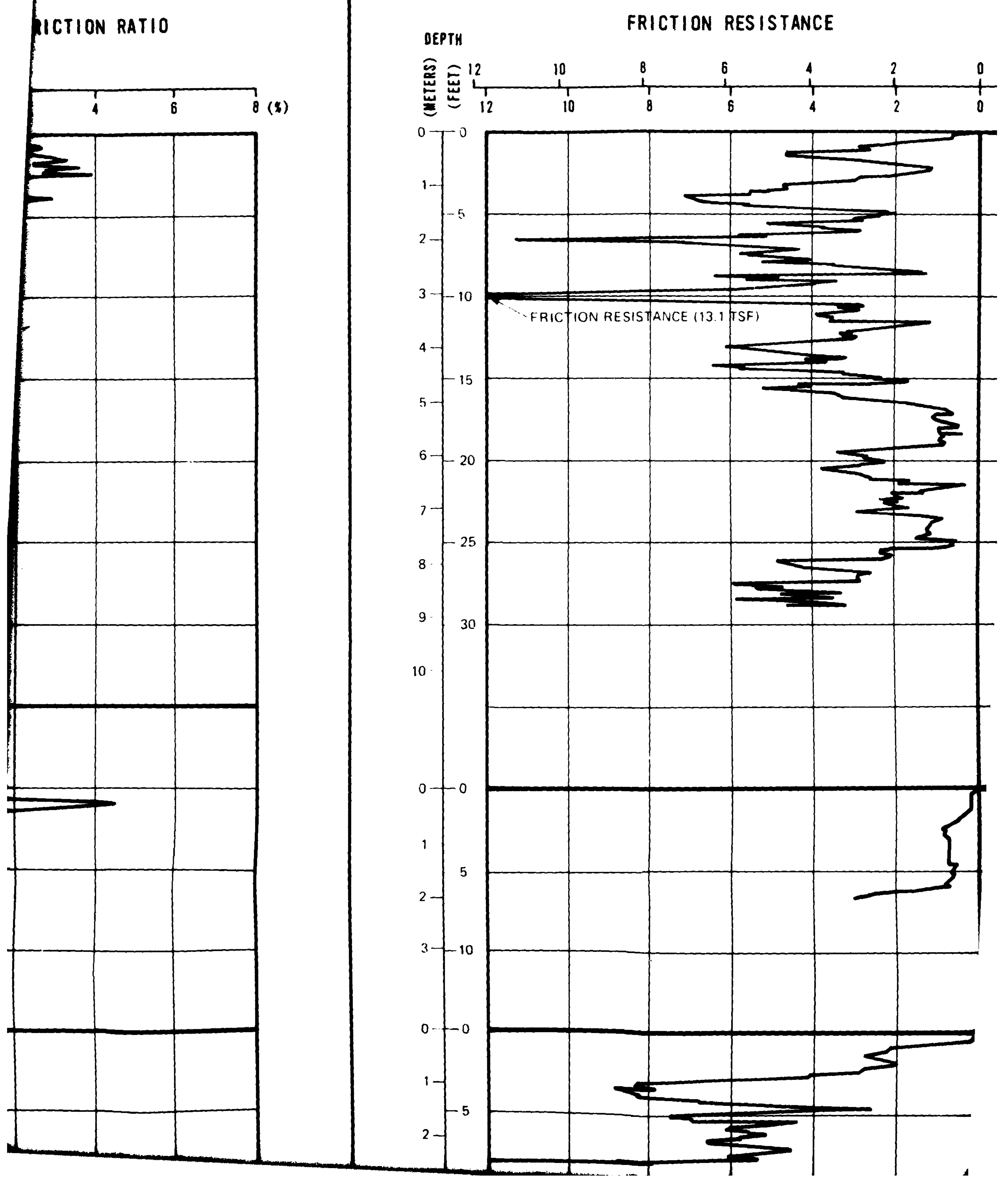
FUGRO NATIONAL, INC.

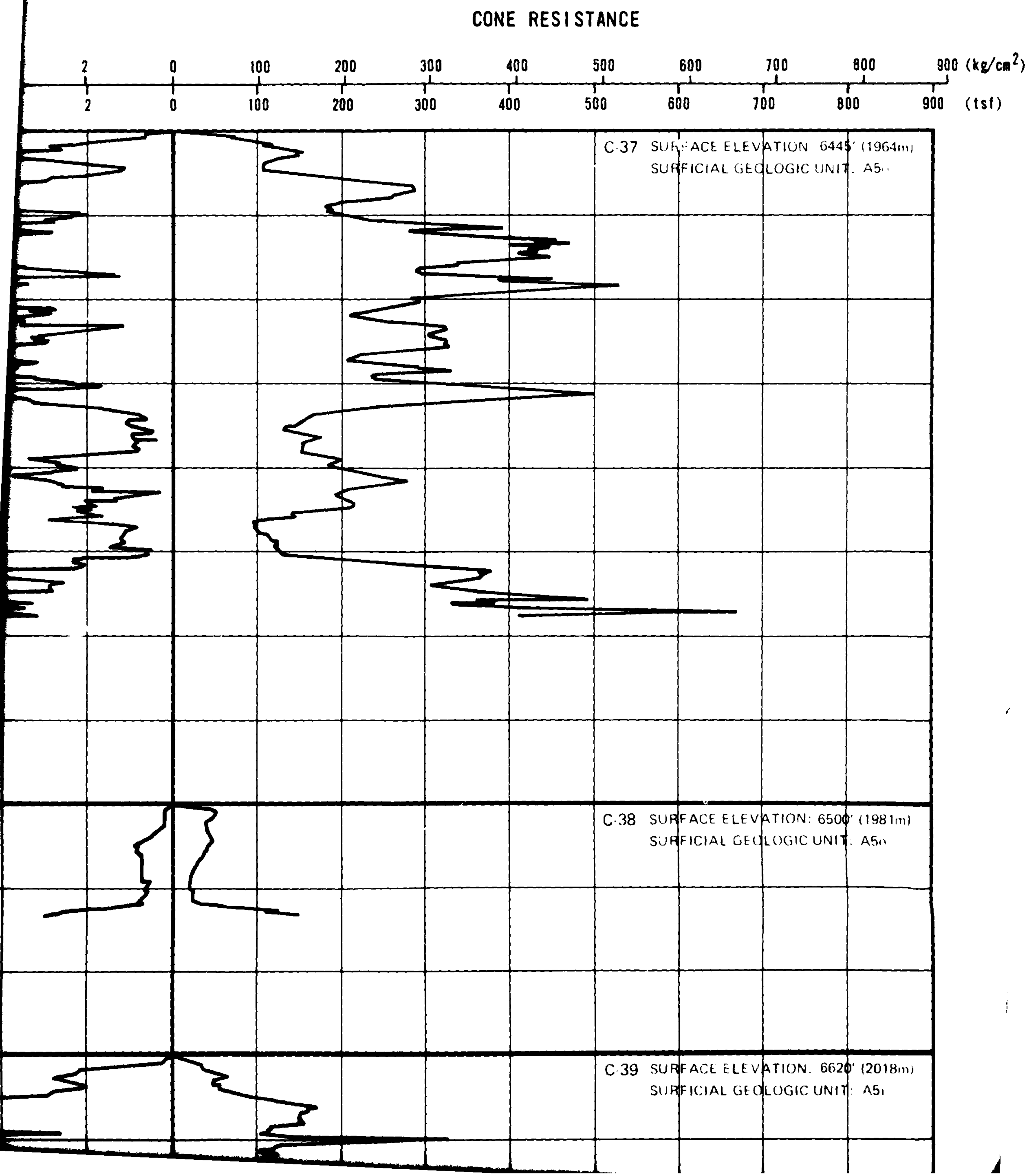

FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12 10 8 6 4 2 0 100 200 300
12 10 8 6 4 2 0 100 200 300
0 1 2 3 4 5 6 7 8
0 5 10 15 20 25
0 1 2 3 4
0 5 10 15
0 1
0 5


CONE RESISTANCE
FRICTION RATIO
400 500 600 700 800 900 (kg/cm2)
400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2 4 6
C-24 SURFACE ELEVATION: 6170' (1881m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-24
C-25 SURFACE ELEVATION: 6280' (1914m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SM
T-10
C-26 SURFACE ELEVATION: 6390' (1948m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-26

3

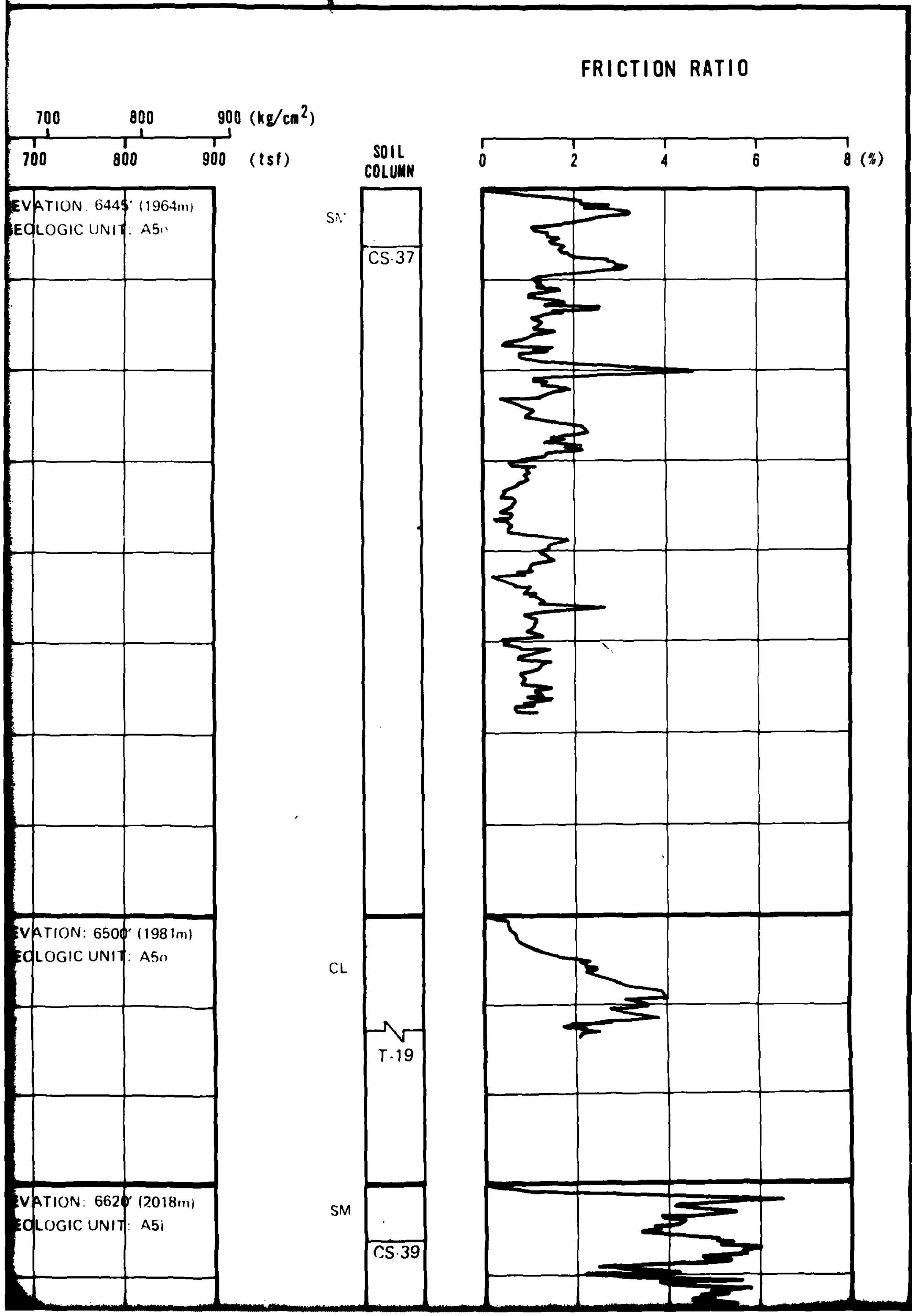

RICTION RATIO
4
6
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
FRICTION RESISTANCE (13.1 TSF)

1A

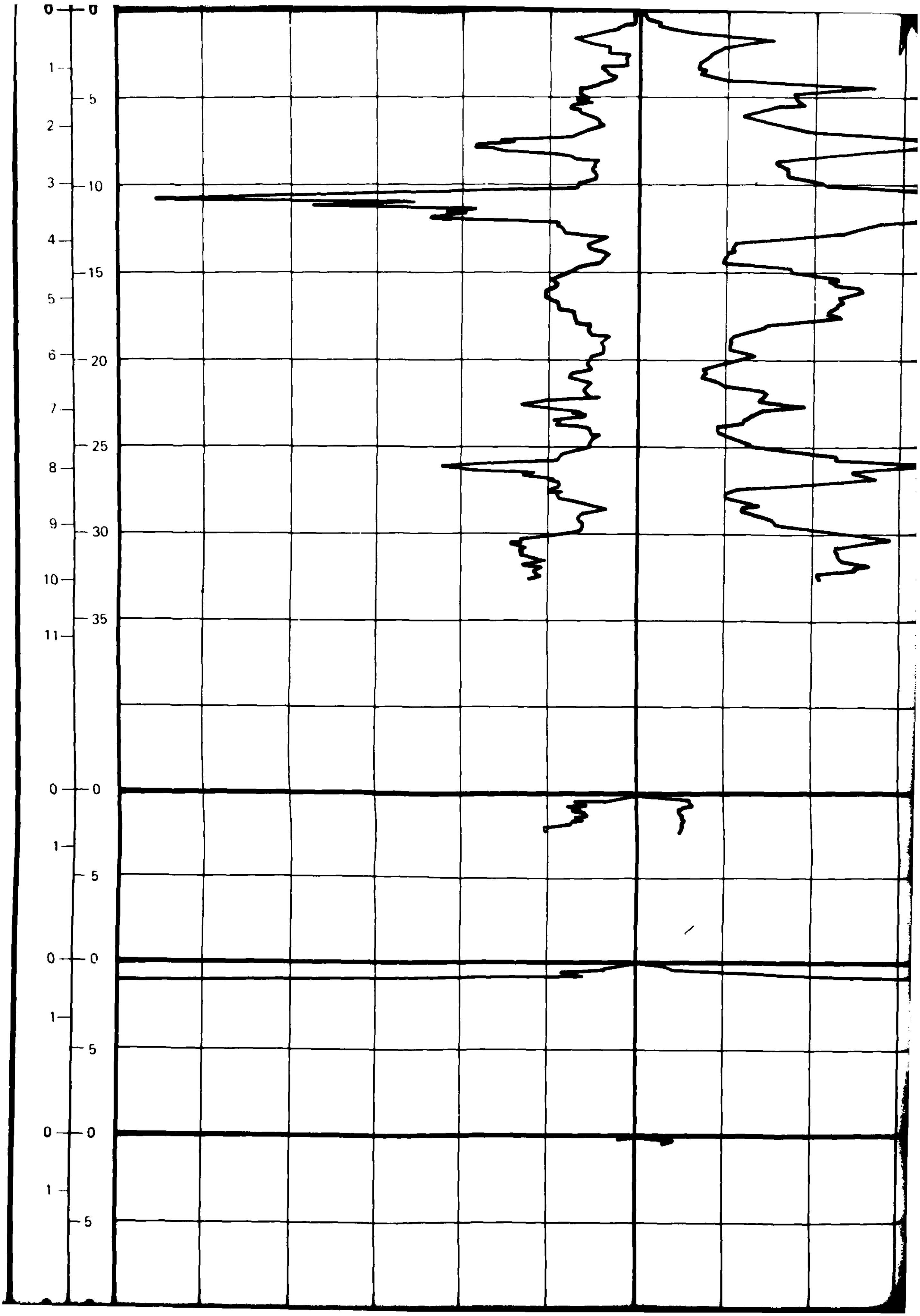


CONE RESISTANCE
2 0 100 200 300 400 500 600 700 800 900 (kg/cm2)
2 0 100 200 300 400 500 600 700 800 900 (tsf)
C-37 SURFACE ELEVATION 6445' (1964m)
SURFICIAL GEOLOGIC UNIT: A5
C-38 SURFACE ELEVATION: 6500' (1981m)
SURFICIAL GEOLOGIC UNIT: A5
C-39 SURFACE ELEVATION: 6620' (2018m)
SURFICIAL GEOLOGIC UNIT: A5

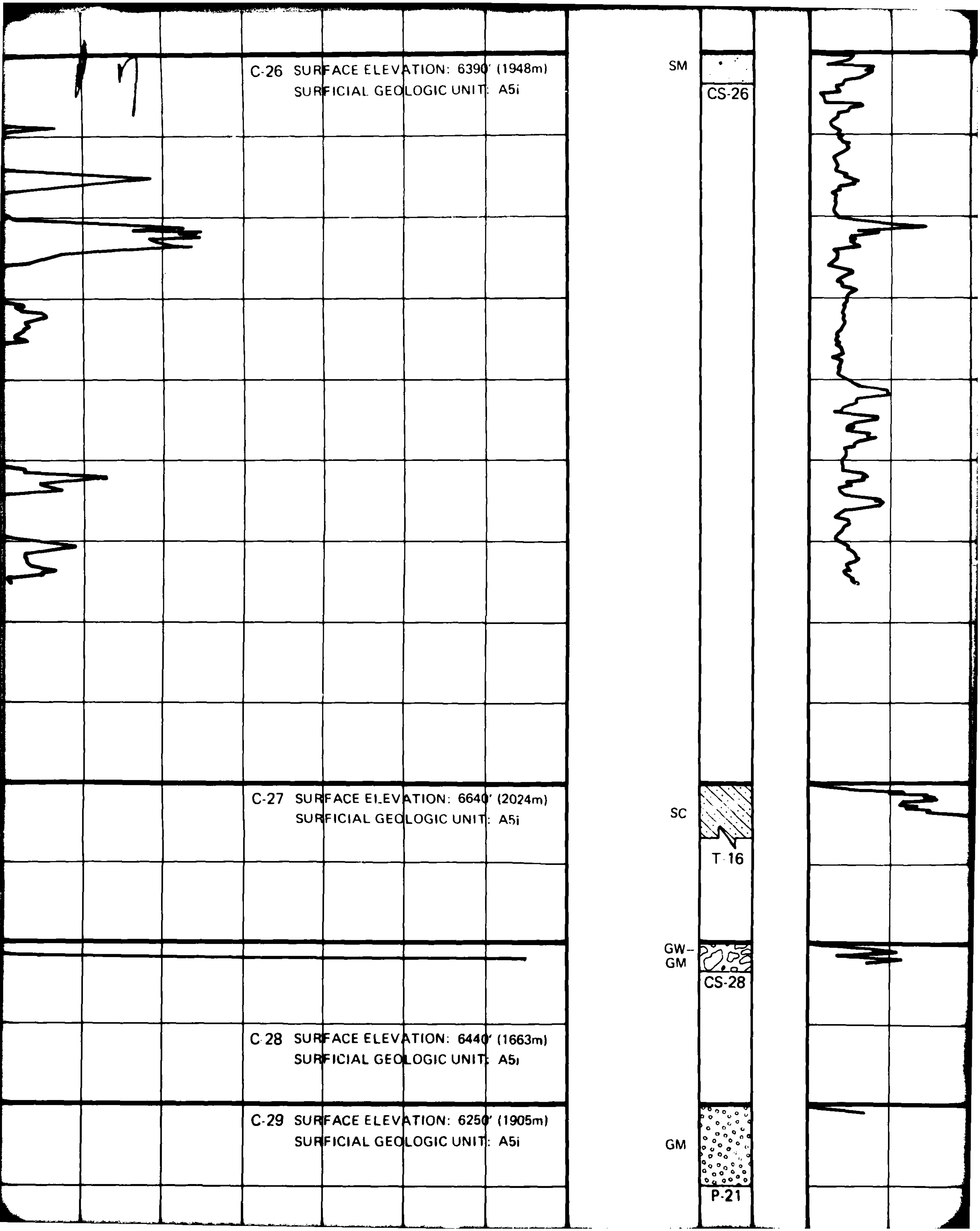
15

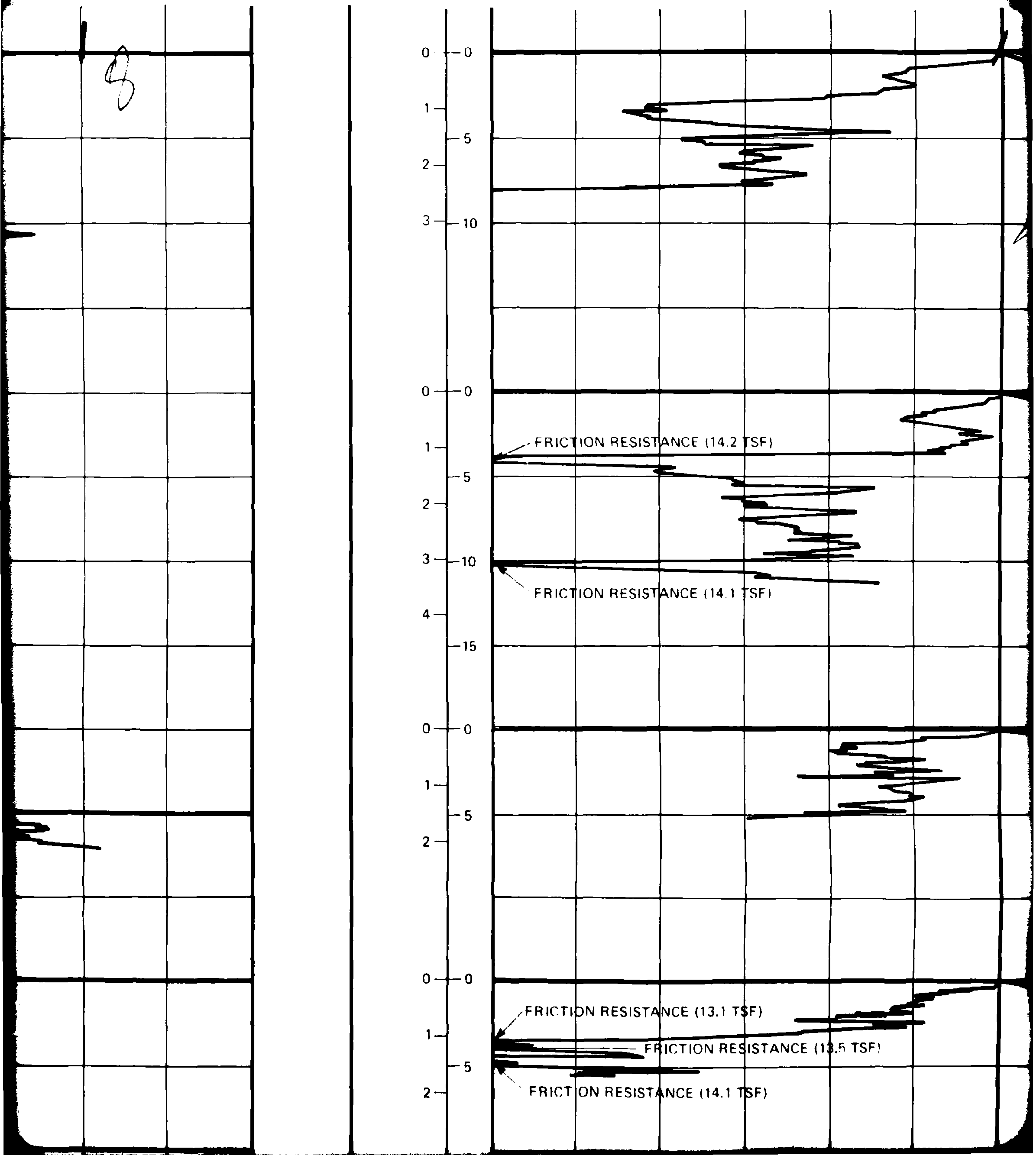


FRICTION RATIO
700 800 900 (kg/cm^2)
700 800 900 (tsf)
SOIL COLUMN
0 2 4 6 8 (%)
EVATION: 6445' (1964m)
EOLOGIC UNIT: A5o
SM
CS-37
EVATION: 6500' (1981m)
EOLOGIC UNIT: A5o
CL
T-19
EVATION: 6620' (2018m)
EOLOGIC UNIT: A5i
SM
CS-39

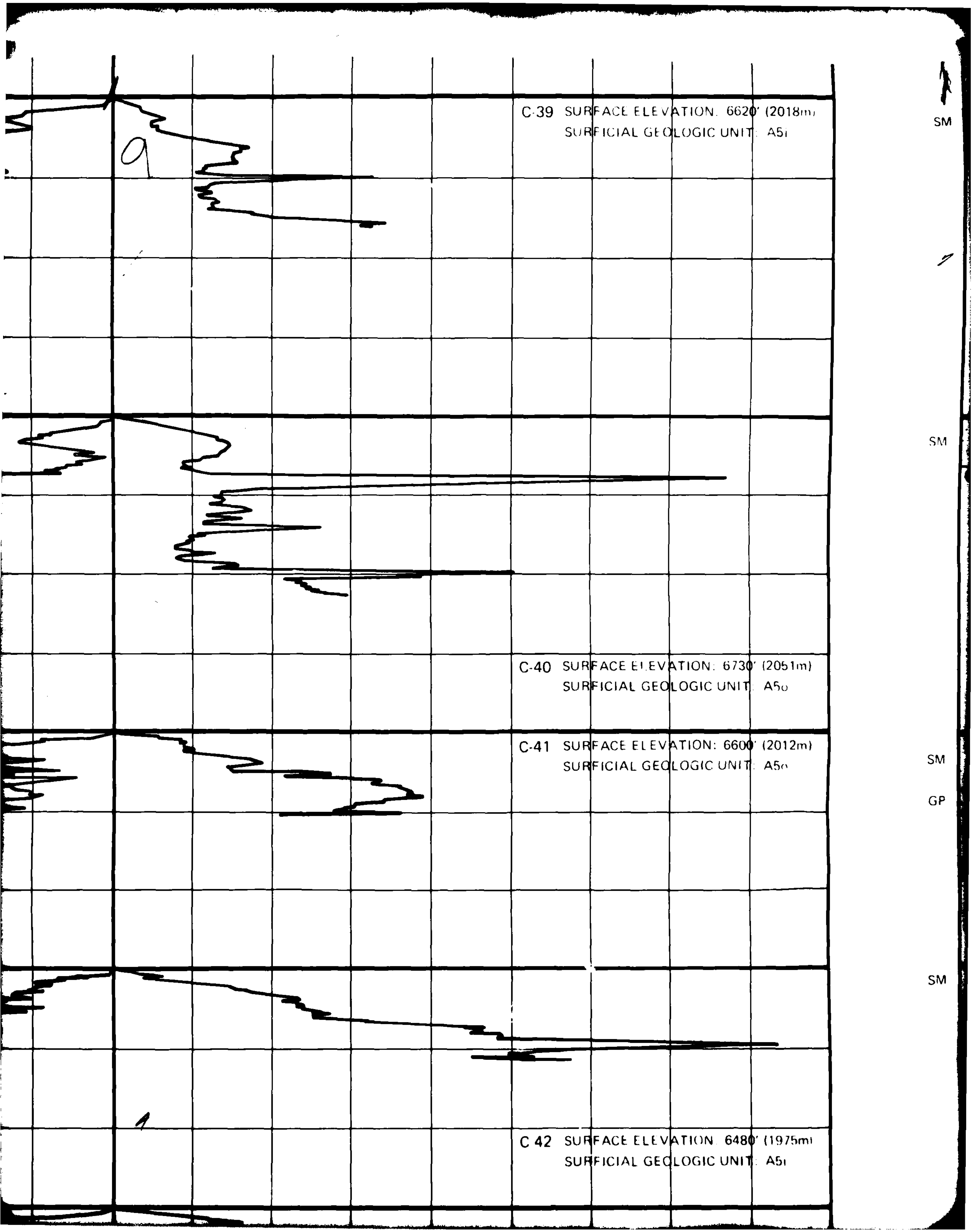


0
1
2
3
4
5
6
7
8
9
10
11
0
5
10
15
20
25
30
35
0
1
0
5
0
1
0
5
0
1
0
5

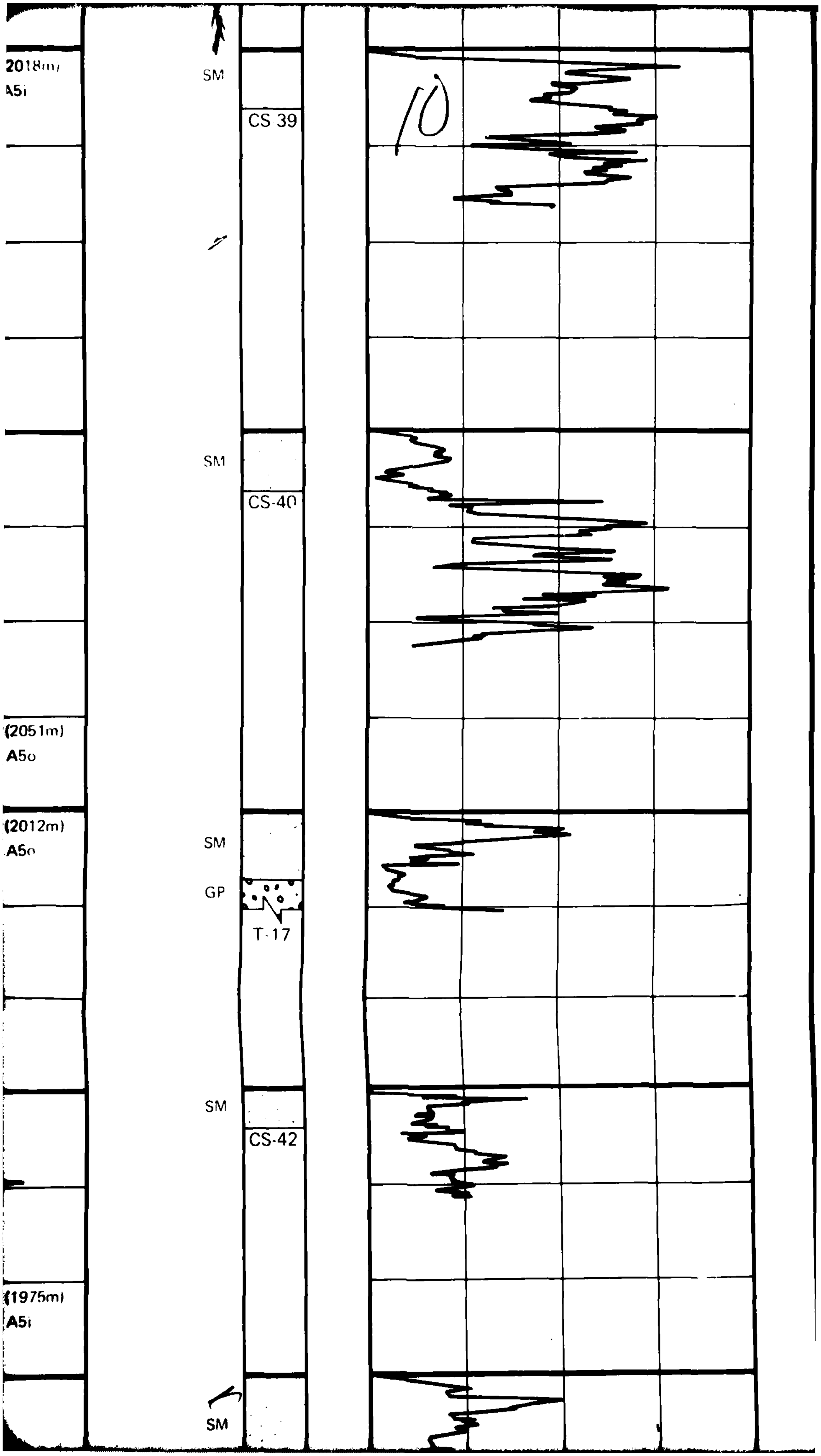

C-26 SURFACE ELEVATION: 6390' (1948m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-26
C-27 SURFACE ELEVATION: 6640' (2024m)
SURFICIAL GEOLOGIC UNIT: A5i
SC
T-16
GW–GM
CS-28
C-28 SURFACE ELEVATION: 6440' (1663m)
SURFICIAL GEOLOGIC UNIT: A5i
C-29 SURFACE ELEVATION: 6250' (1905m)
SURFICIAL GEOLOGIC UNIT: A5i
GM
P-21



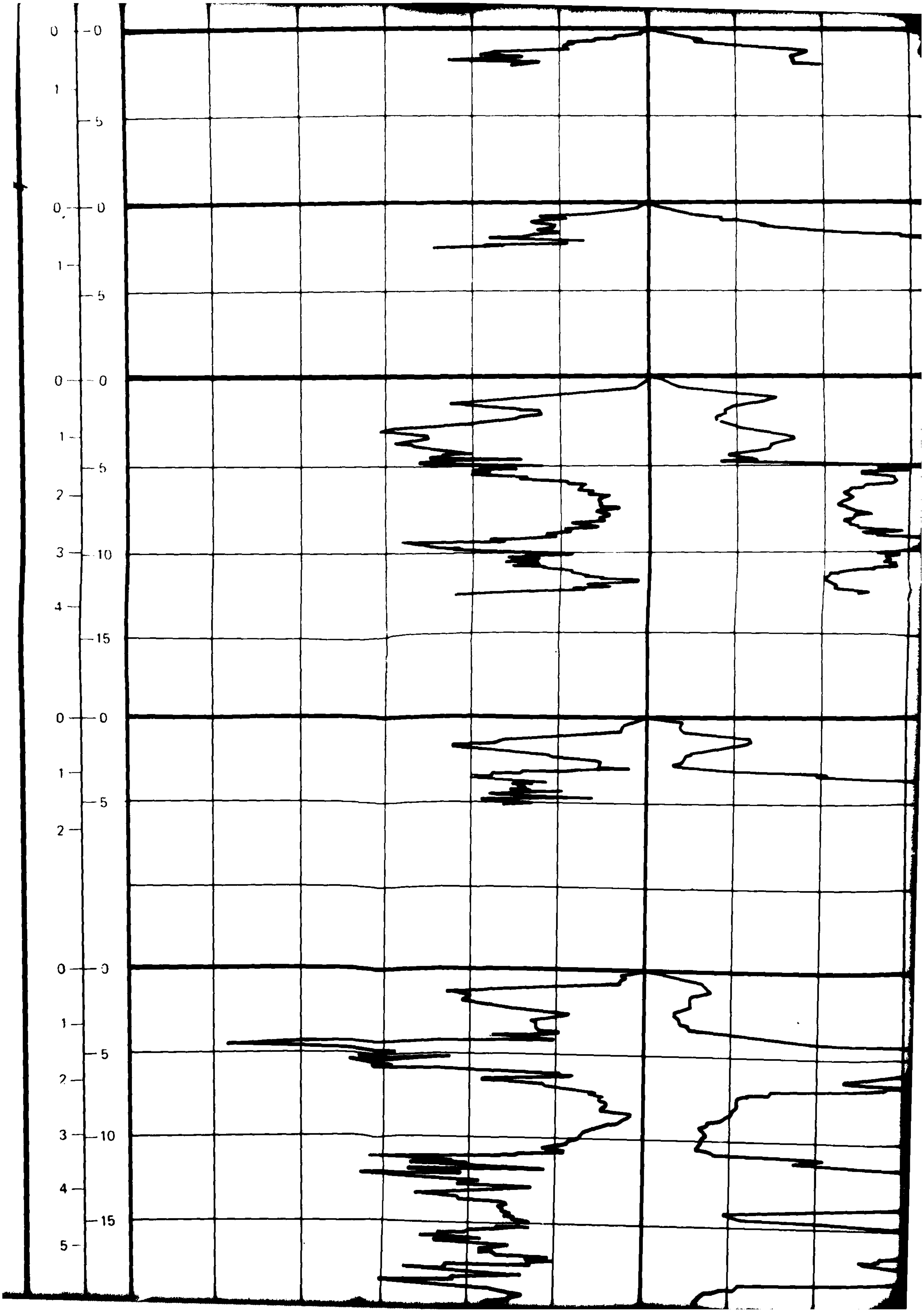
FRICTION RESISTANCE (14.2 TSF)
FRICTION RESISTANCE (14.1 TSF)
FRICTION RESISTANCE (13.1 TSF)
FRICTION RESISTANCE (13.5 TSF)
FRICTION RESISTANCE (14.1 TSF)

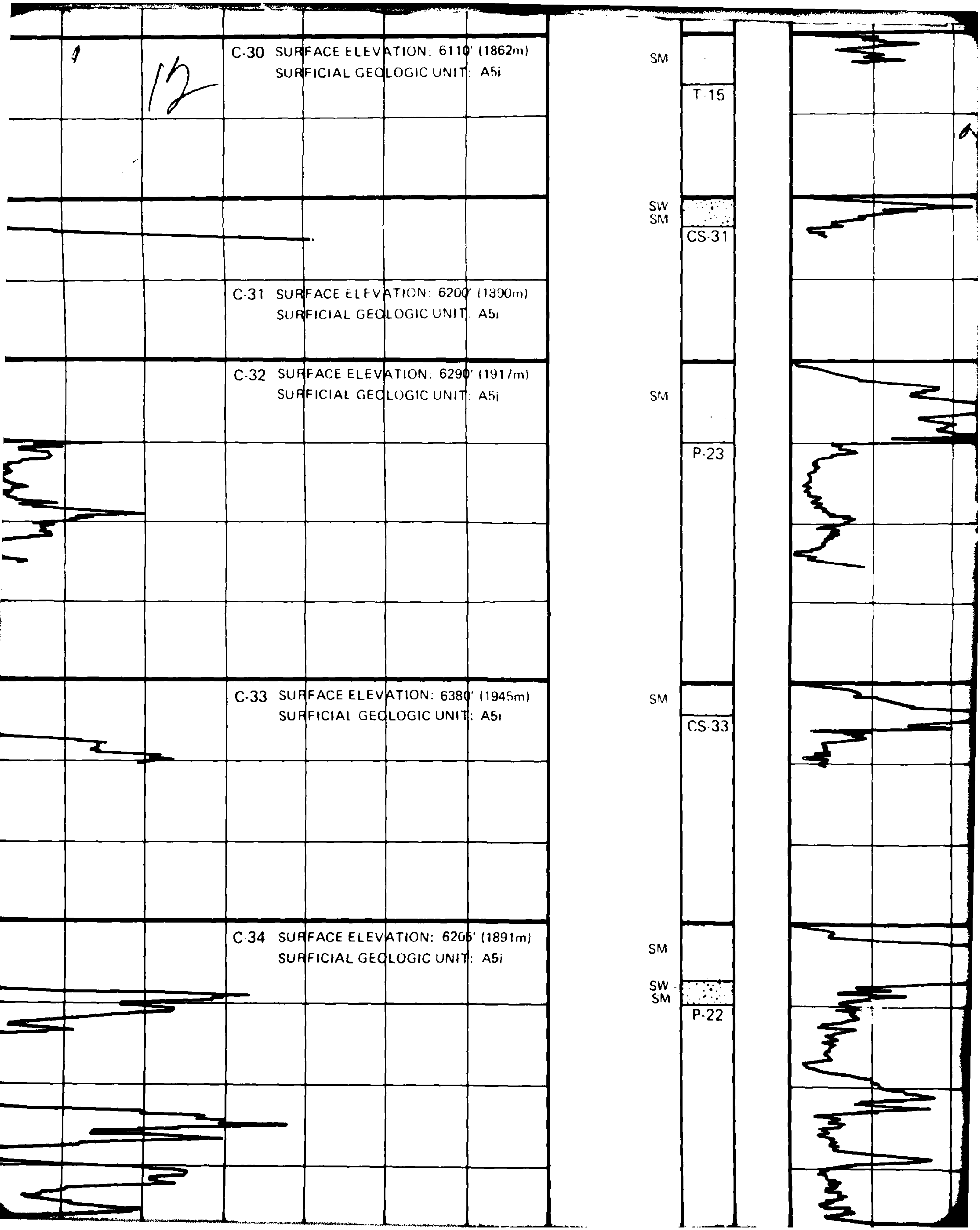


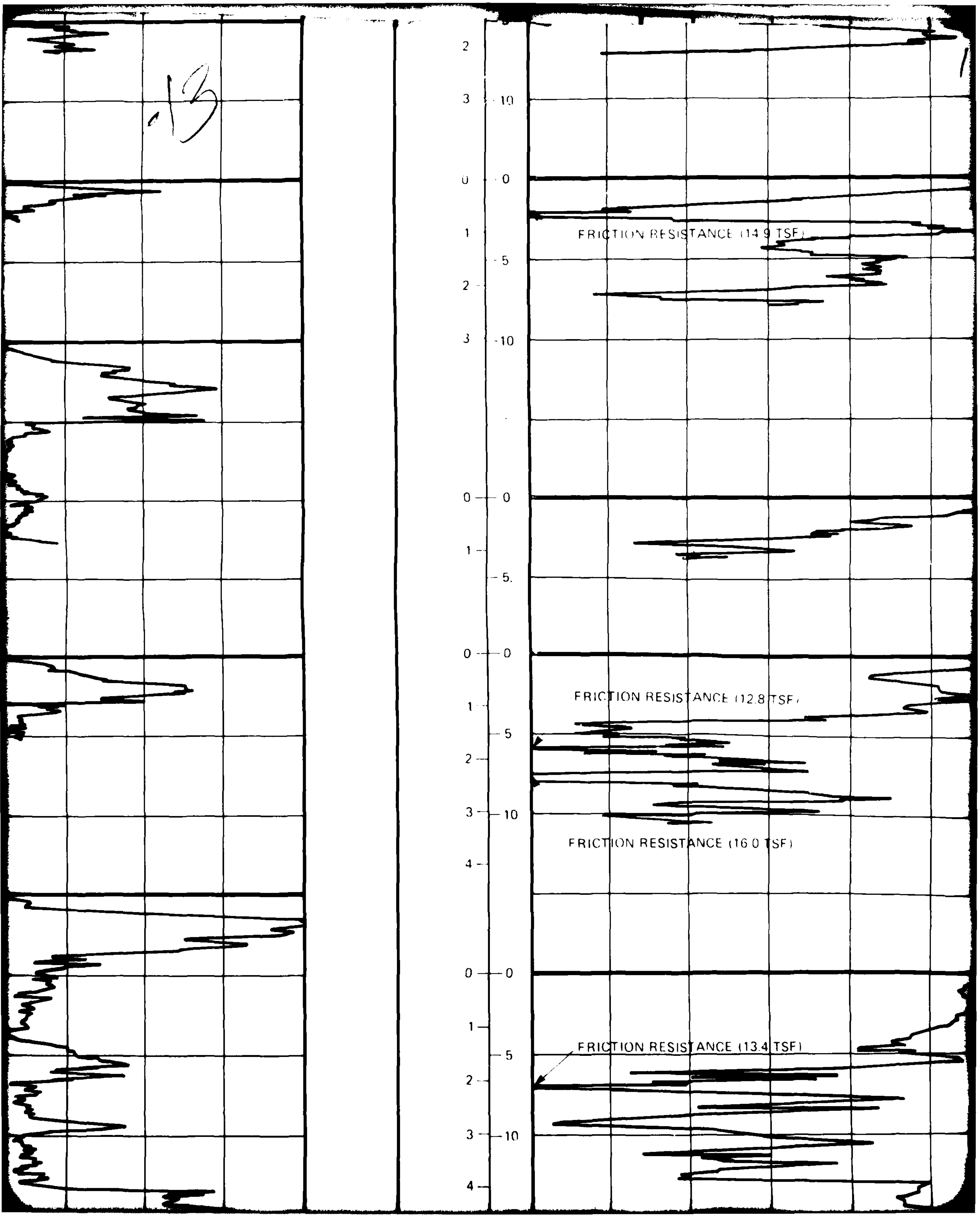
C-39 SURFACE ELEVATION: 6620' (2018m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SM
C-40 SURFACE ELEVATION: 6730' (2051m)
SURFICIAL GEOLOGIC UNIT: A5o
C-41 SURFACE ELEVATION: 6600' (2012m)
SURFICIAL GEOLOGIC UNIT: A5o
SM
GP
SM
C 42 SURFACE ELEVATION: 6480' (1975m)
SURFICIAL GEOLOGIC UNIT: A5i



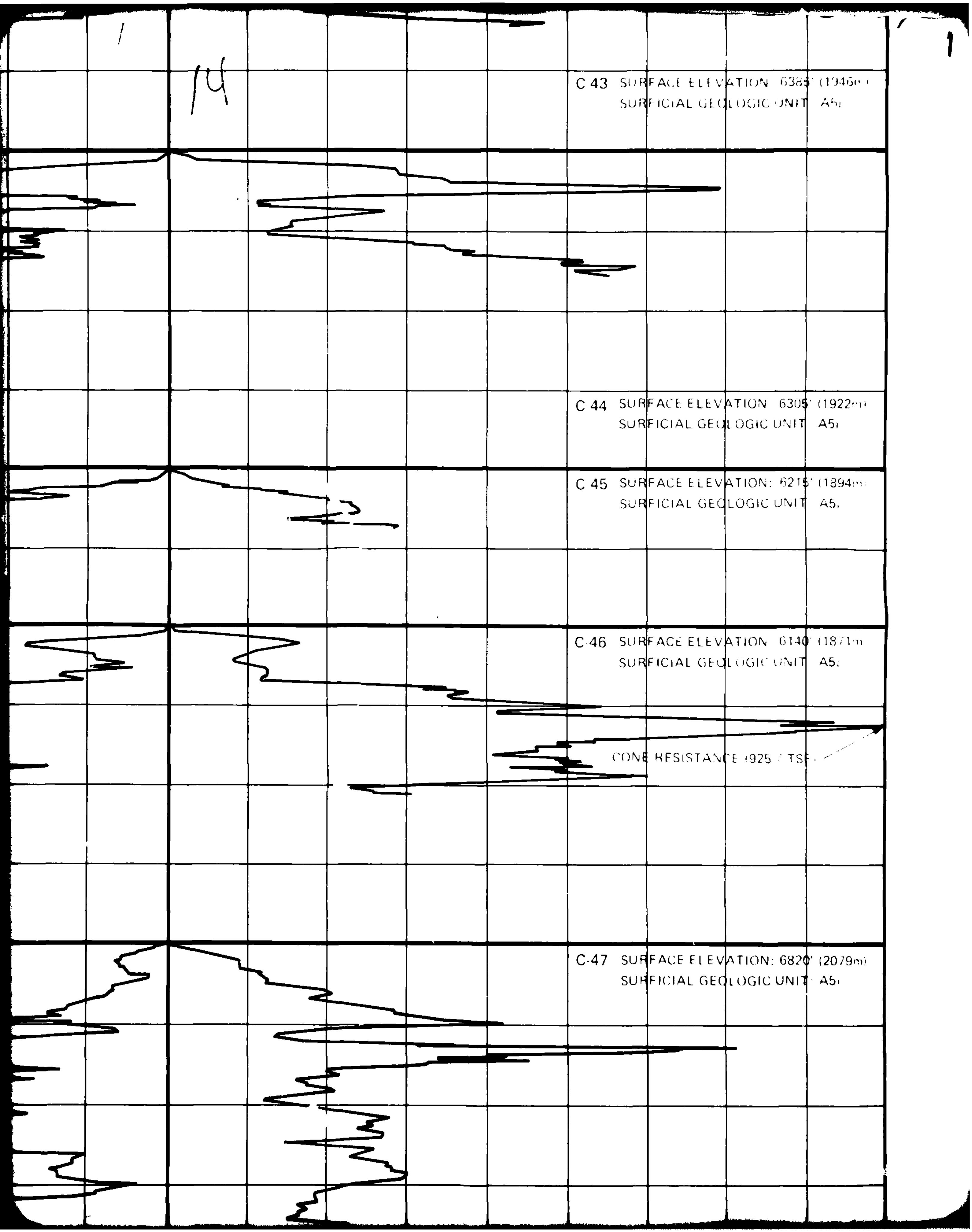
(2018m)
A5i
SM
CS 39
10
SM
CS-40
(2051m)
A5o
(2012m)
A5o
SM
GP
T-17
SM
CS-42
(1975m)
A5i
SM


0
0
1
5
0
0
1
5
0
0
1
5
2
3
10
4
15
0
0
1
5
2
0
0
1
5
2
3
10
4
15
5


1
12
C-30 SURFACE ELEVATION: 6110' (1862m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
T-15
SW-SM
CS-31
C-31 SURFACE ELEVATION: 6200' (1890m)
SURFICIAL GEOLOGIC UNIT: A5i
C-32 SURFACE ELEVATION: 6290' (1917m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
P-23
C-33 SURFACE ELEVATION: 6380' (1945m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-33
C-34 SURFACE ELEVATION: 6205' (1891m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SW-SM
P-22



FRICTION RESISTANCE (14.9 TSF)
FRICTION RESISTANCE (12.8 TSF)
FRICTION RESISTANCE (16.0 TSF)
FRICTION RESISTANCE (13.4 TSF)


14
1
C 43 SURFACE ELEVATION 6385' (1946m)
SURFICIAL GEOLOGIC UNIT A5i
C-44 SURFACE ELEVATION 6305' (1922m)
SURFICIAL GEOLOGIC UNIT A5i
C 45 SURFACE ELEVATION: 6215' (1894m)
SURFICIAL GEOLOGIC UNIT A5i
C-46 SURFACE ELEVATION 6140' (1871m)
SURFICIAL GEOLOGIC UNIT A5i
CONE RESISTANCE (925 TSF)
C-47 SURFACE ELEVATION: 6820' (2079m)
SURFICIAL GEOLOGIC UNIT A5i

115

N: 6365' (1946m)
C UNIT: A5i

SM
CS 44

ON: 6305' (1922m)
IC UNIT: A5i

ON: 6215' (1894m)
GIC UNIT: A5i

SM
SP
SM
P 25

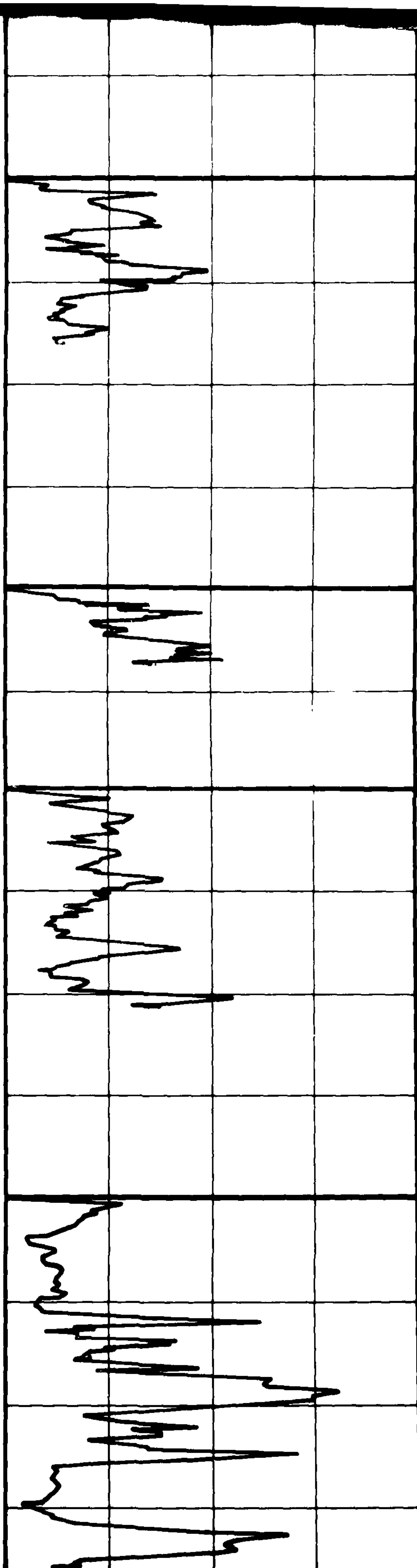
ON: 6140' (1871m)
GIC UNIT: A5i

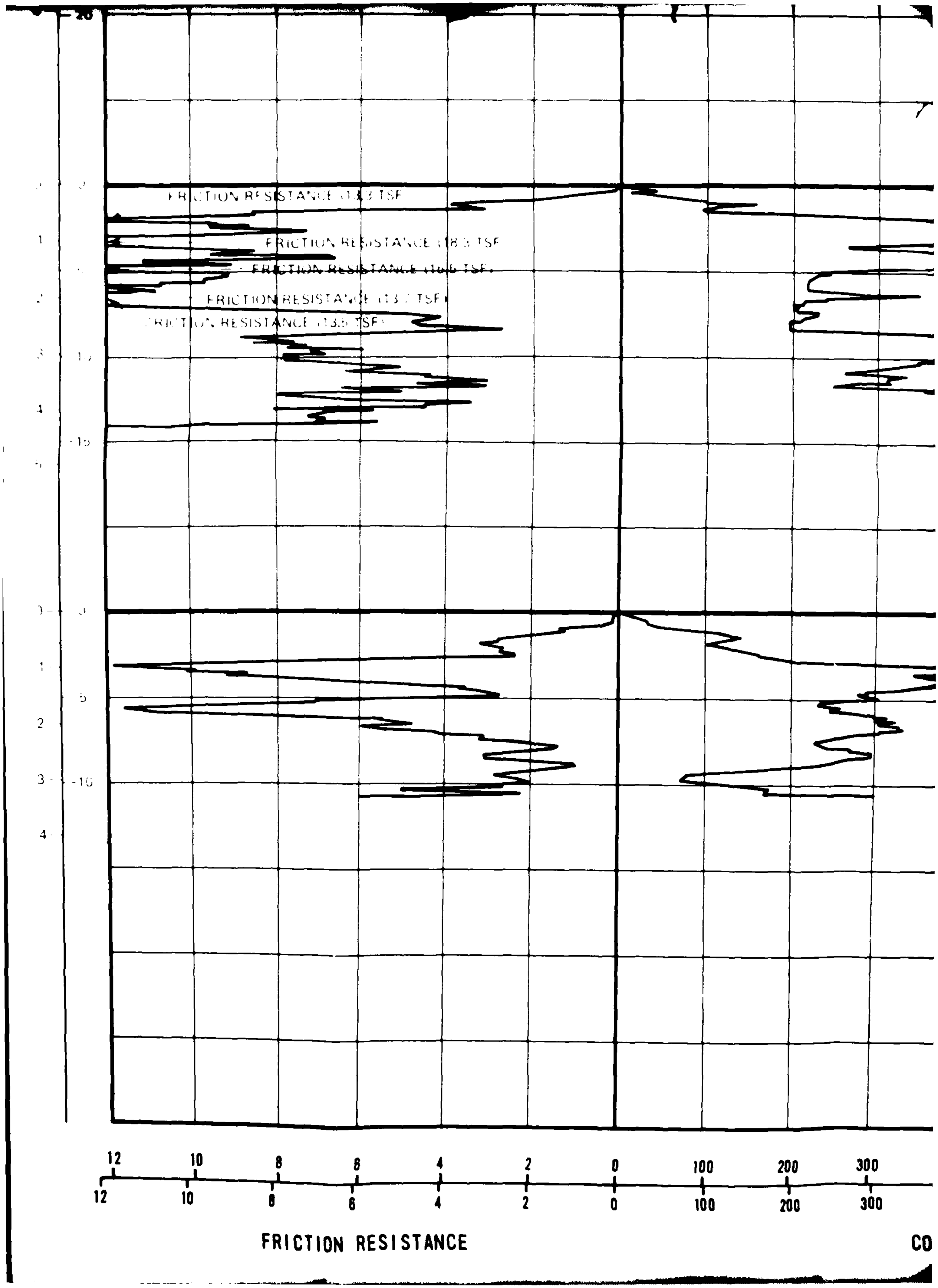
SM
CS 46

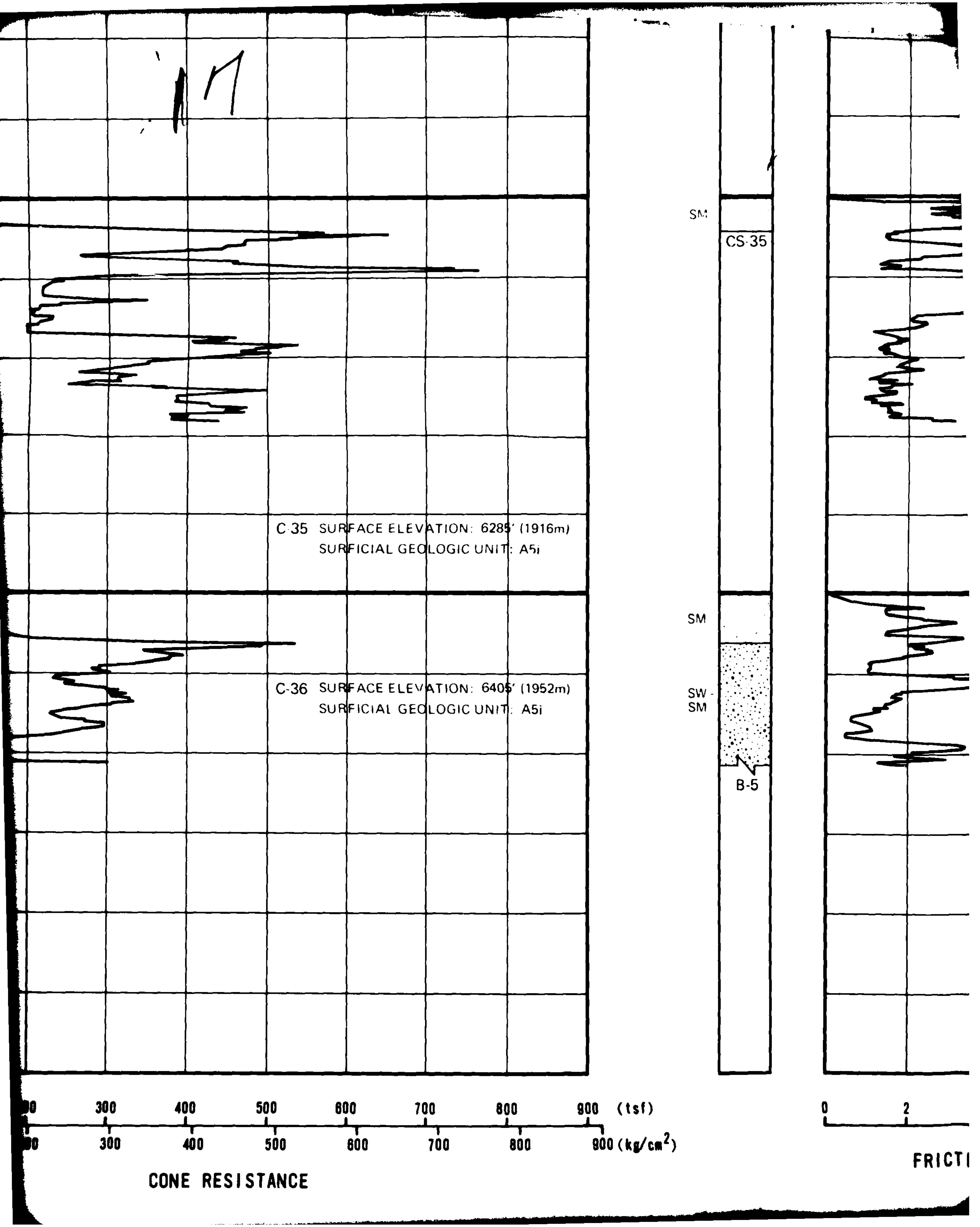
925 (TSF)

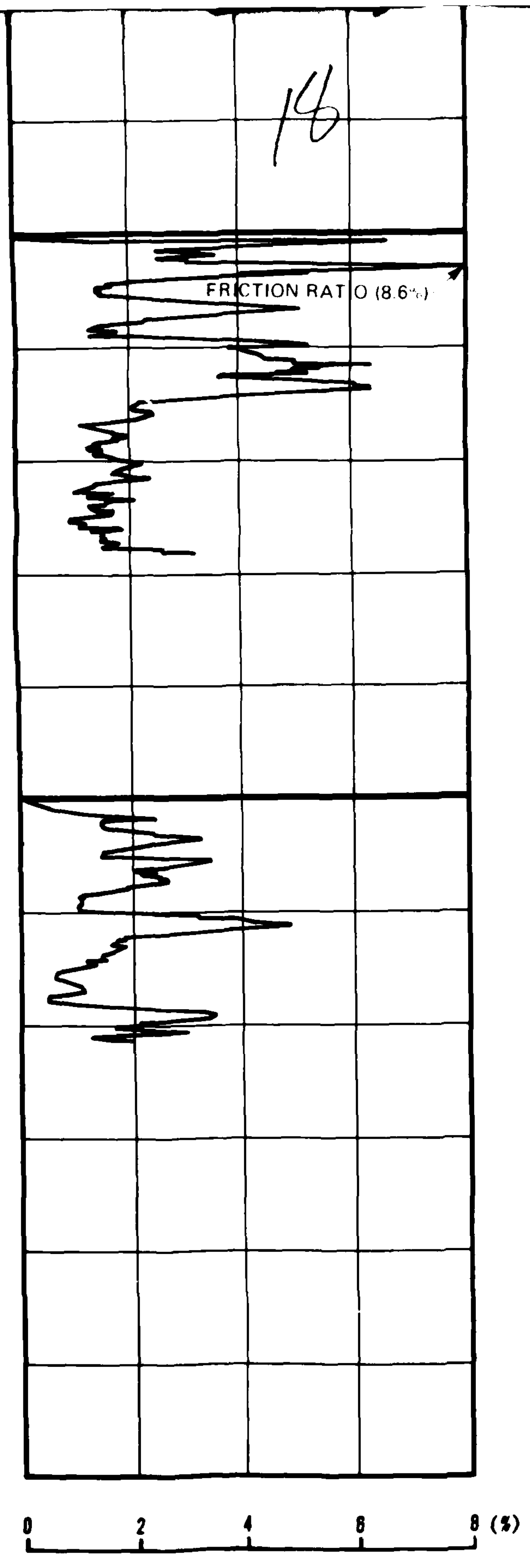
ON: 6820' (2079m)
GIC UNIT: A5i

SM
CS-47

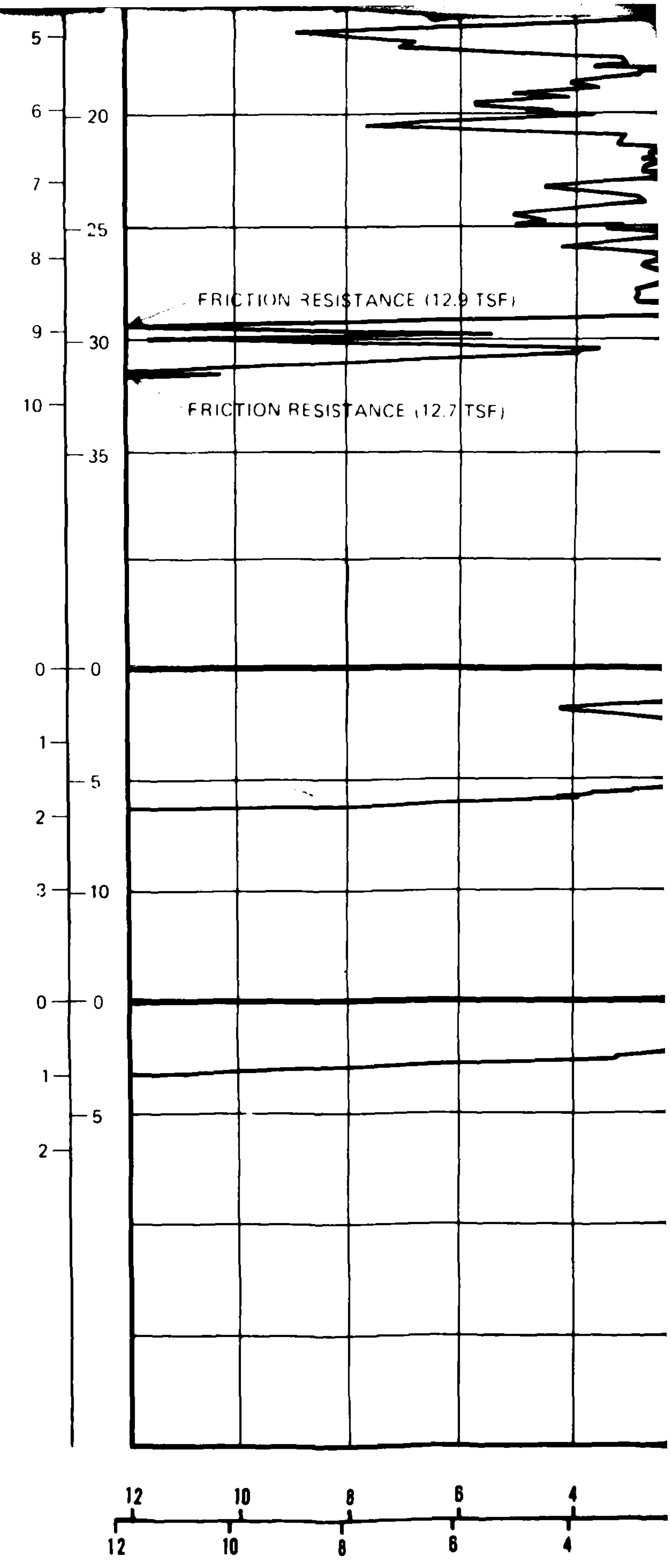



12 10 8 6 4 2 0 100 200 300
FRICTION RESISTANCE
CO

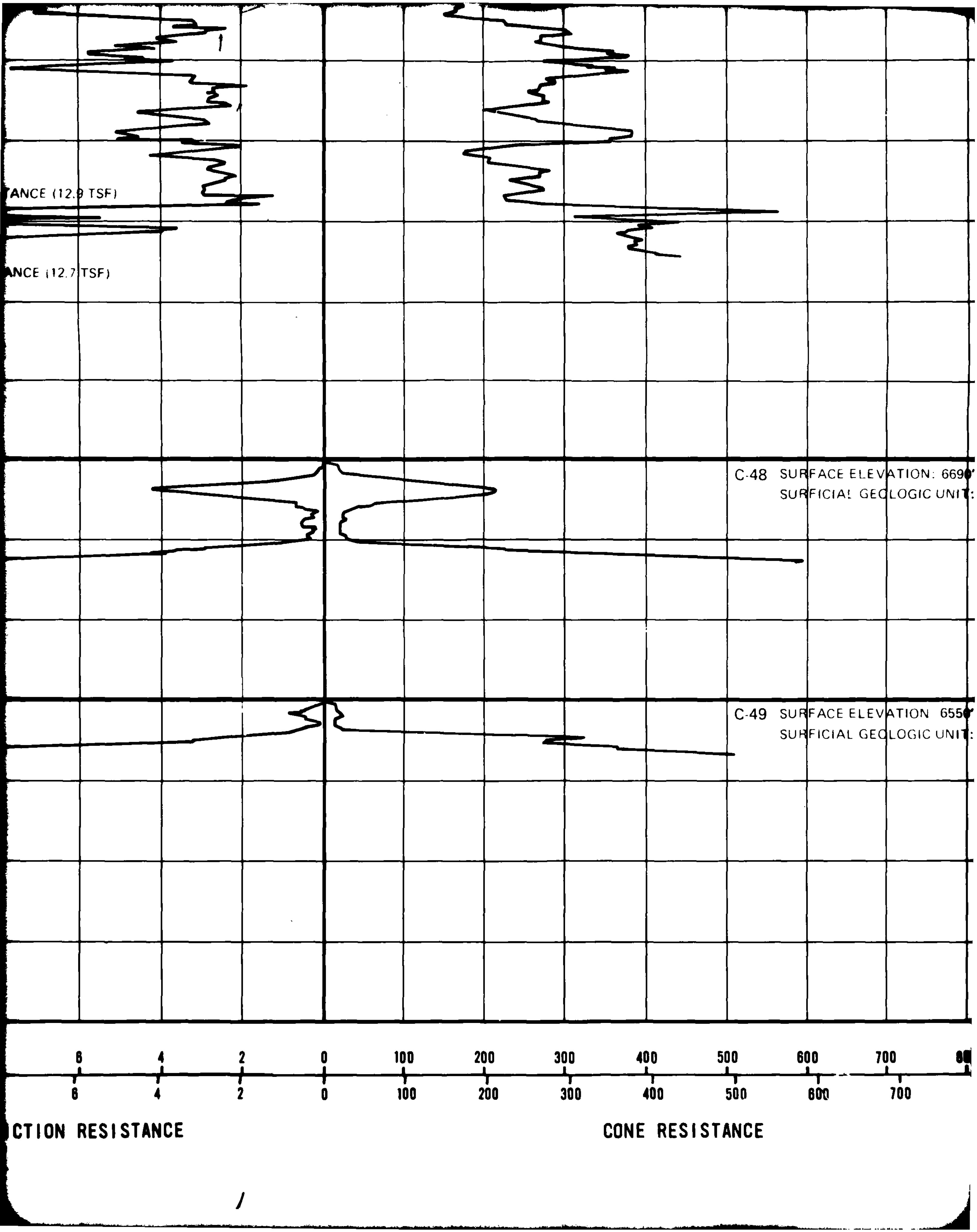

17
SM
CS-35
C-35 SURFACE ELEVATION: 6285' (1916m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SW - SM
B-5
C-36 SURFACE ELEVATION: 6405' (1952m)
SURFICIAL GEOLOGIC UNIT: A5i
300 400 500 600 700 800 900 (tsf)
300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE
0 2
FRICTI



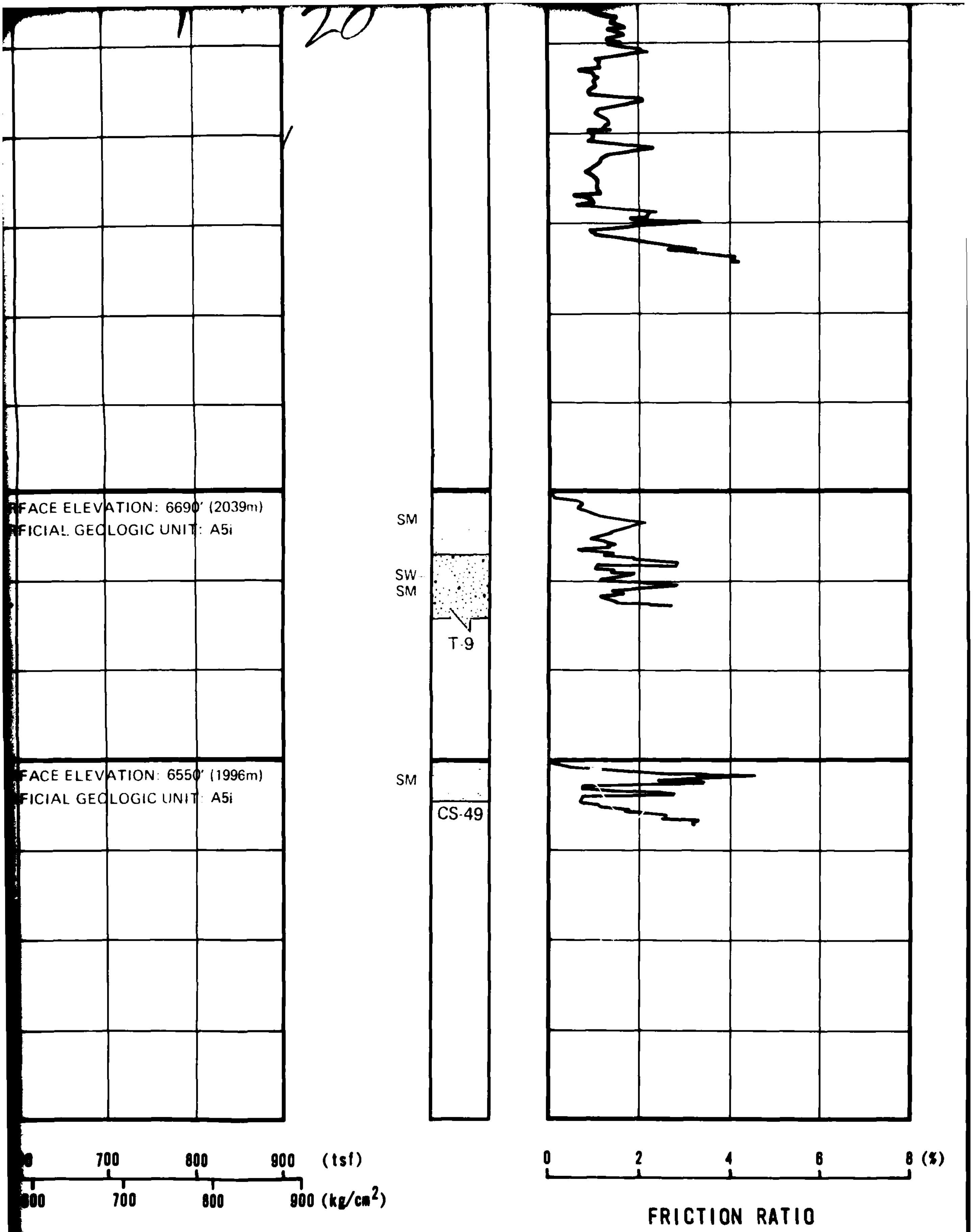
FRICTION RATIO



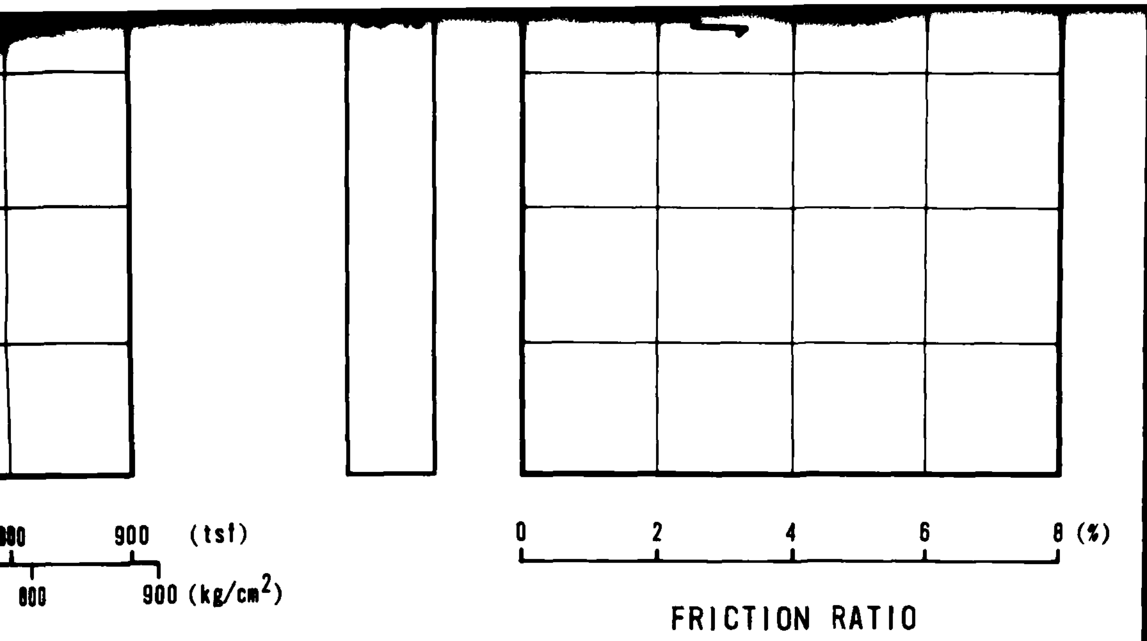
FRICTION RESISTANCE



ANCE (12.9 TSF)
ANCE (12.7 TSF)
C-48 SURFACE ELEVATION: 669
SURFICIAL GEOLOGIC UNIT:
C-49 SURFACE ELEVATION 655
SURFICIAL GEOLOGIC UNIT:
6 4 2 0 100 200 300 400 500 600 700
6 4 2 0 100 200 300 400 500 600 700
CTION RESISTANCE
CONE RESISTANCE



CONE PENETROMETER TEST RESULTS
PINE VALLEY UTAH



CONE PENETROMETER TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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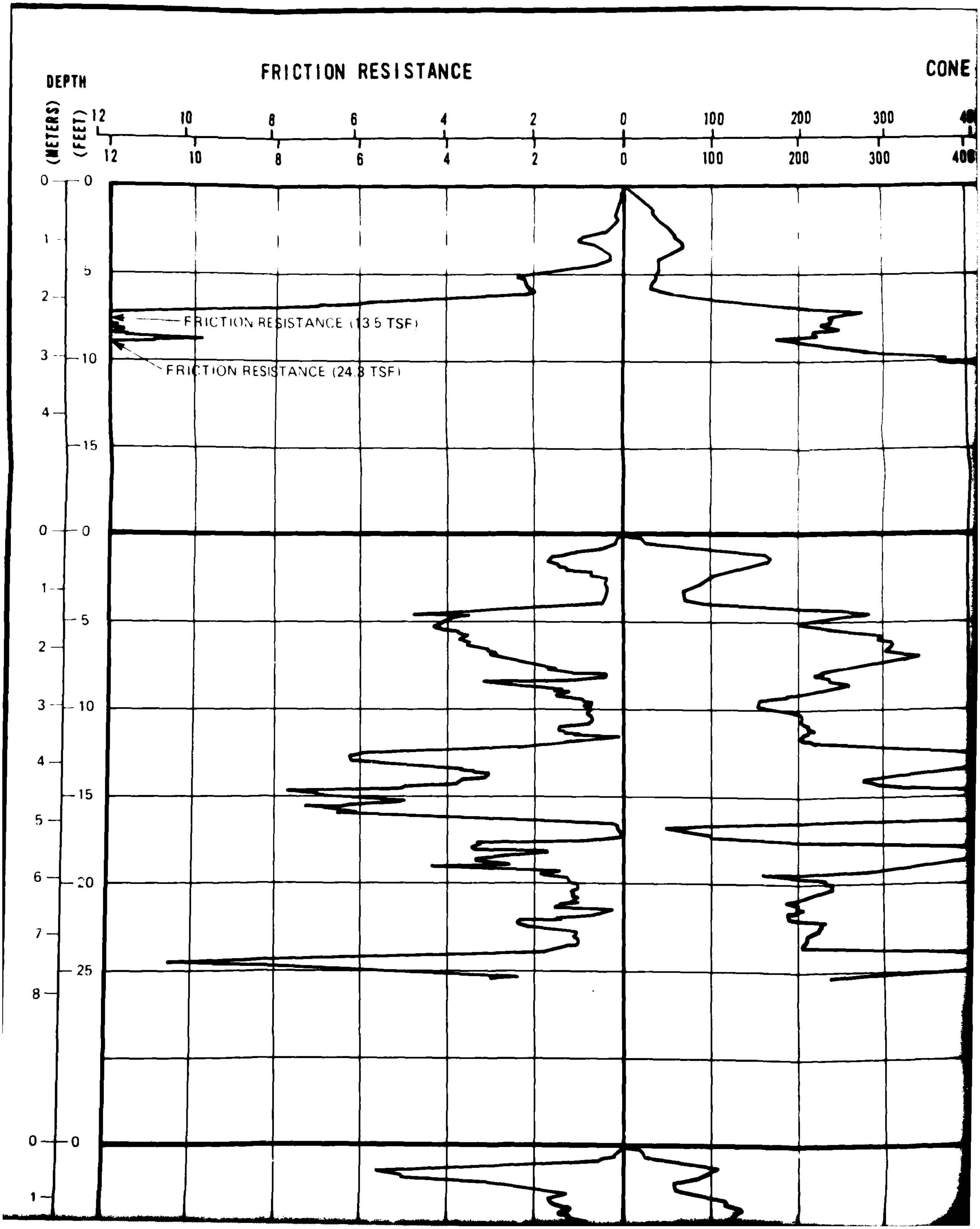
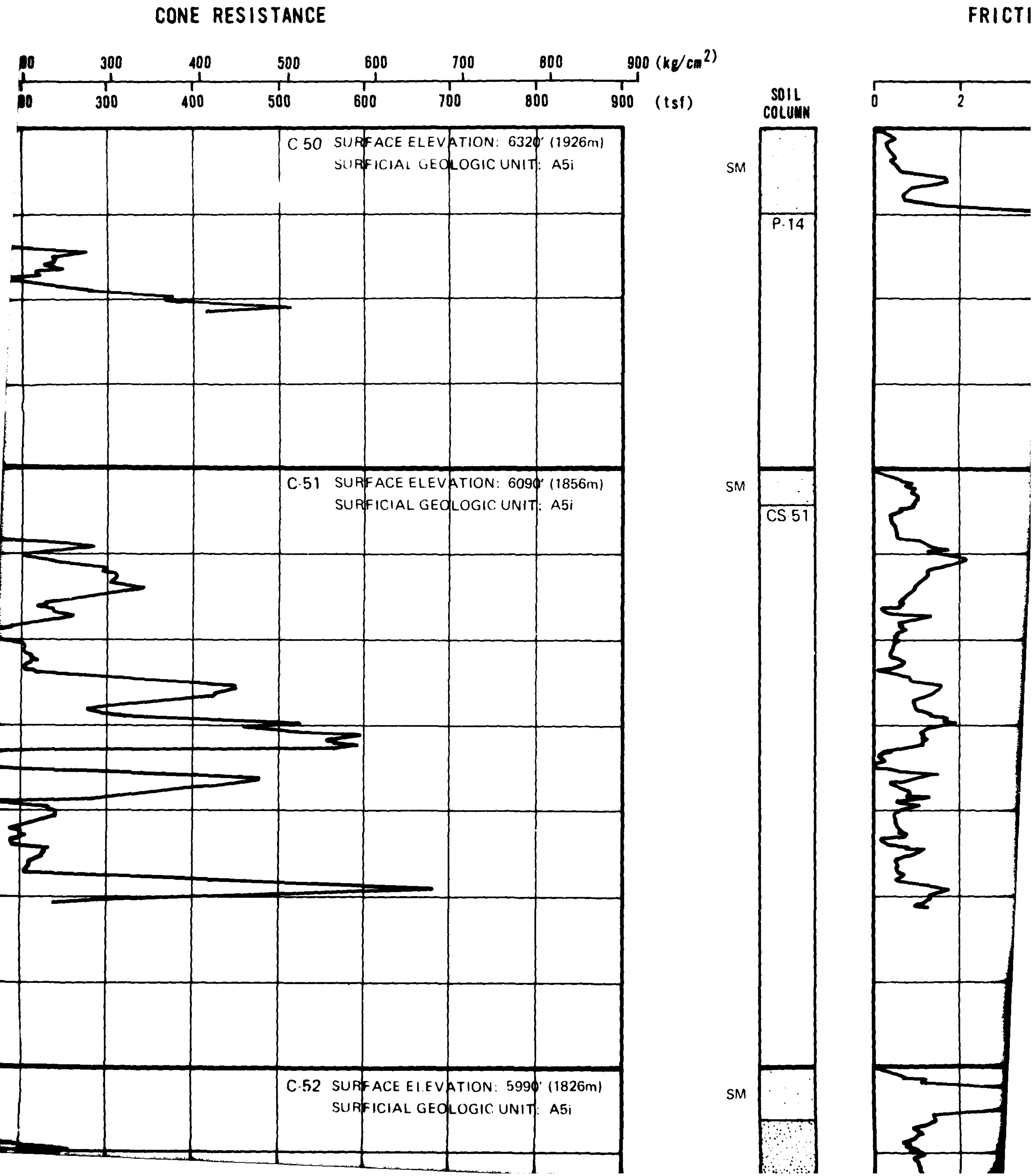
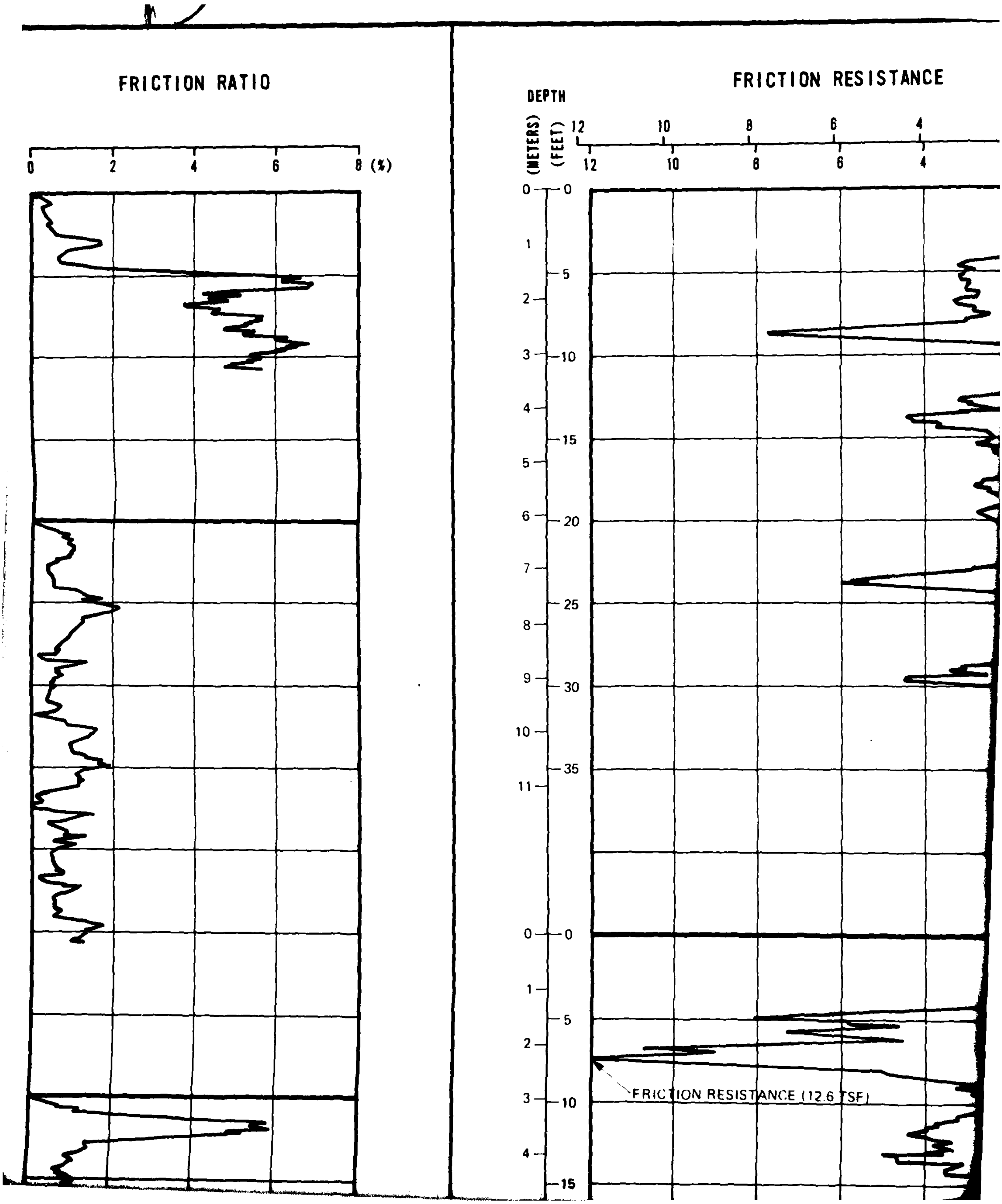
FUGRO NATIONAL, INC.

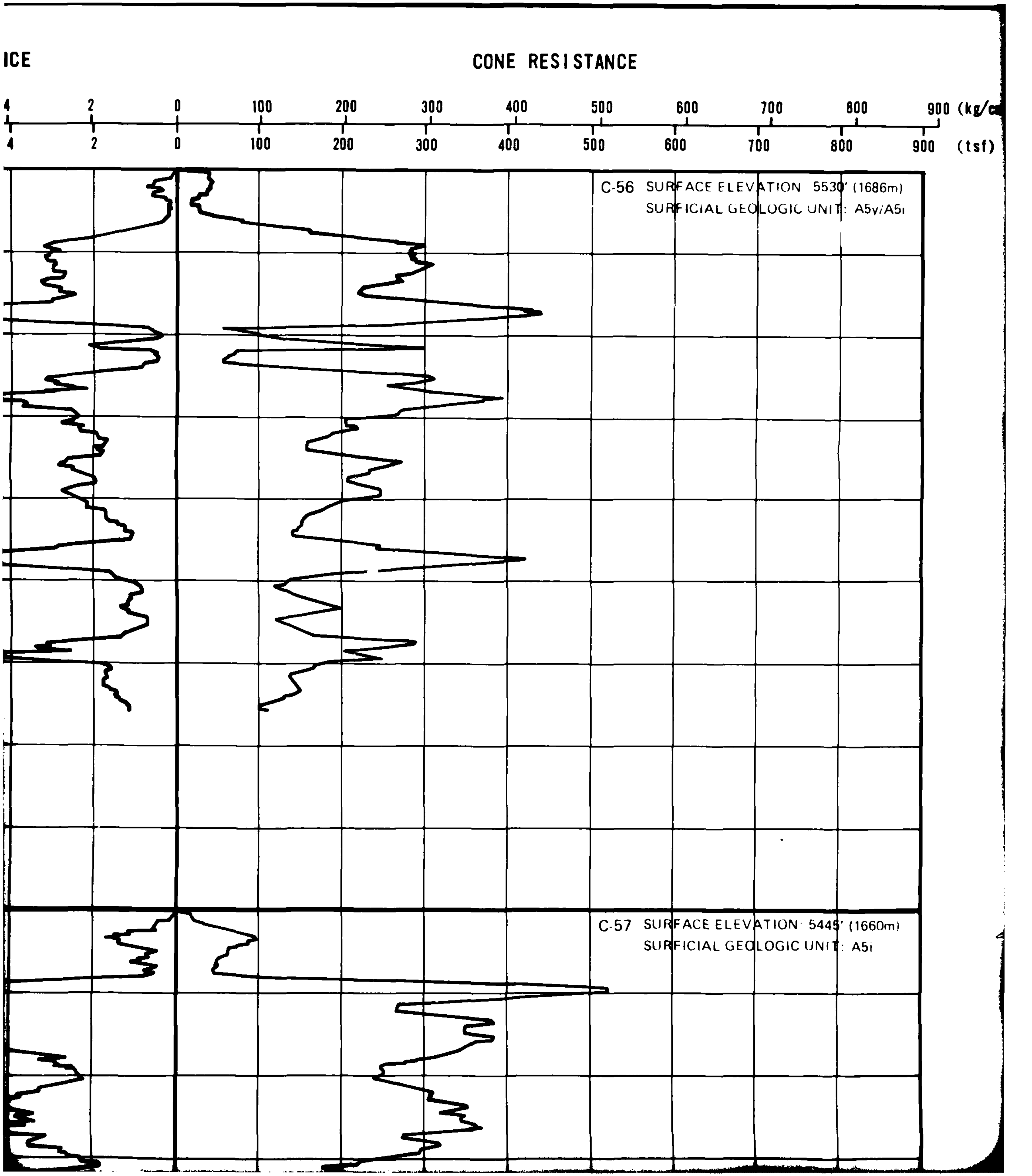


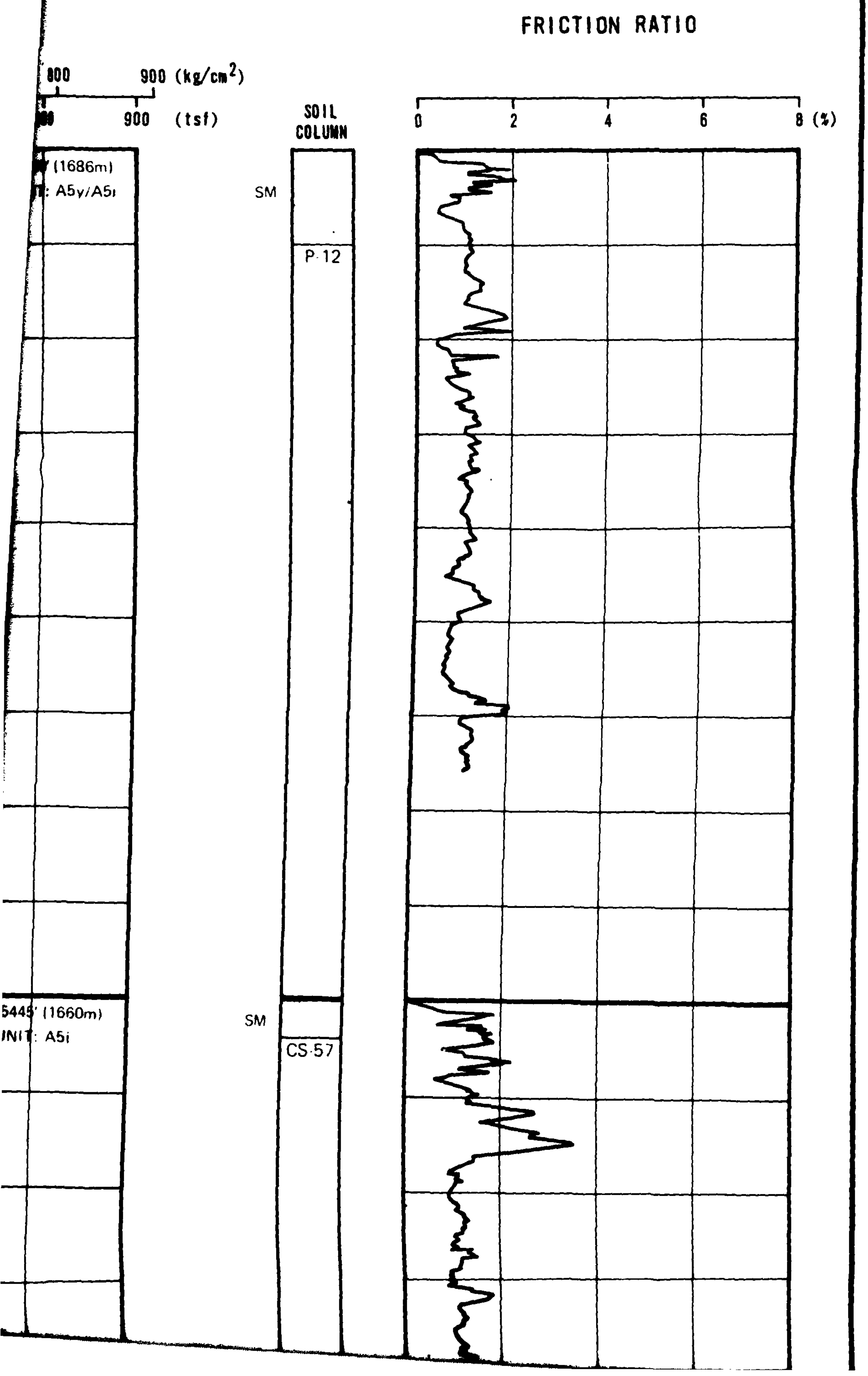
DEPTH
(METERS)
(FEET)
FRICTION RESISTANCE
CONE
12 10 8 6 4 2 0 100 200 300 400
FRICTION RESISTANCE (13.5 TSF)
FRICTION RESISTANCE (24.8 TSF)


CONE RESISTANCE
FRICTI
300 400 500 600 700 800 900 (kg/cm2)
300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2
C 50 SURFACE ELEVATION: 6320' (1926m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
P-14
C-51 SURFACE ELEVATION: 6090' (1856m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-51
C-52 SURFACE ELEVATION: 5990' (1826m)
SURFICIAL GEOLOGIC UNIT: A5i
SM

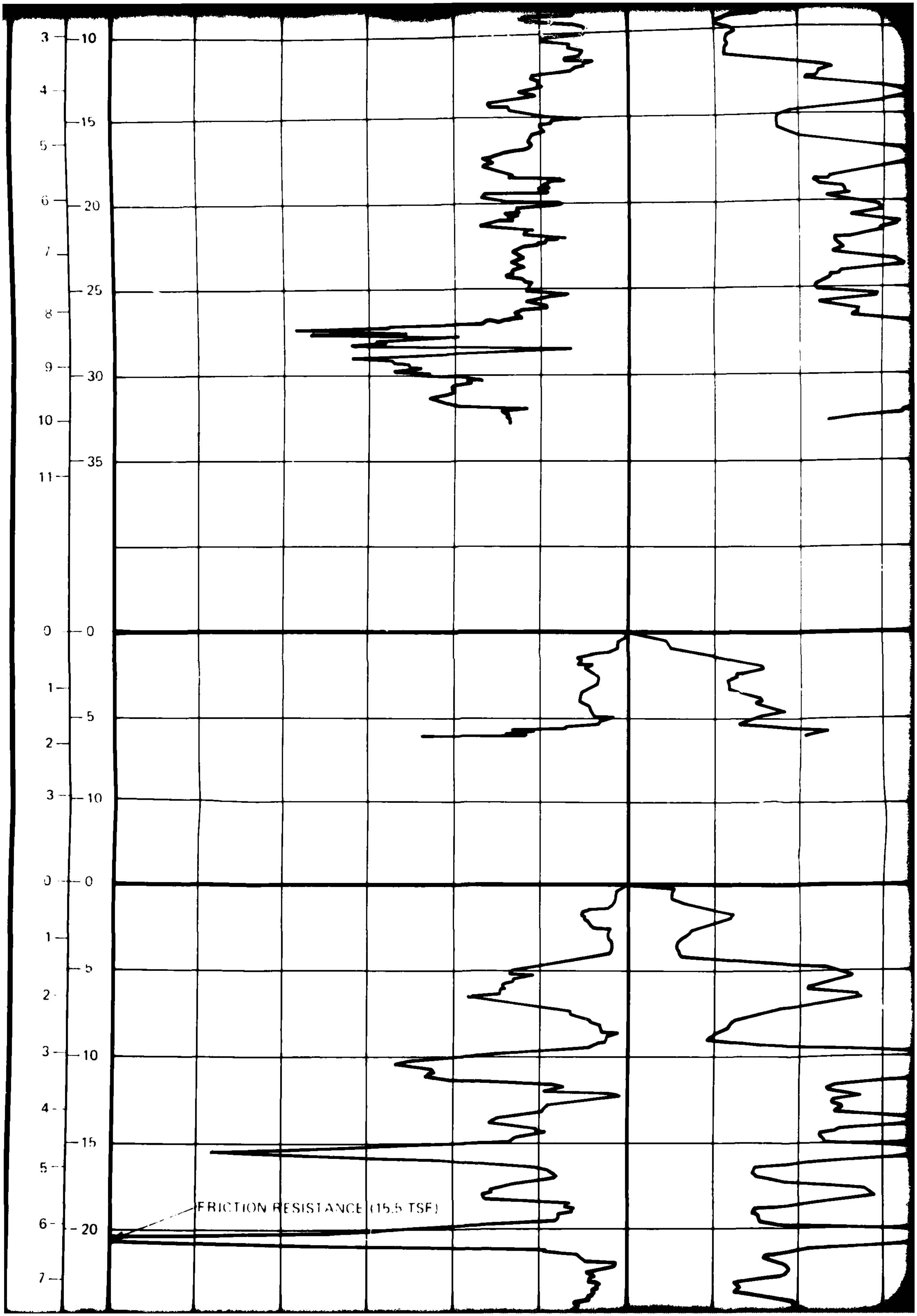


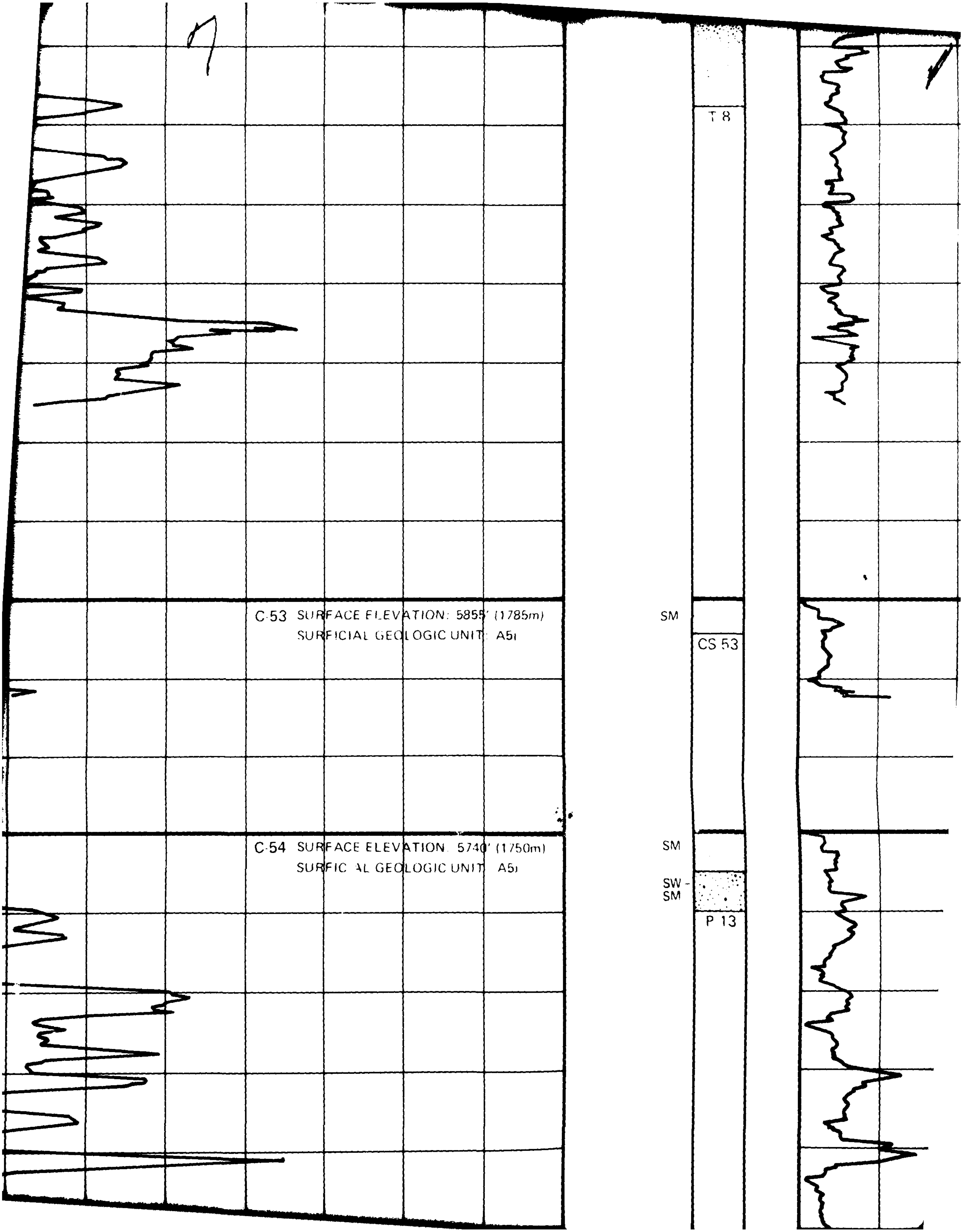
FRICTION RATIO
0
2
4
6
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
0
1
2
3
4
5
6
7
8
9
10
11
5
10
15
20
25
30
35
FRICTION RESISTANCE (12.6 TSF)

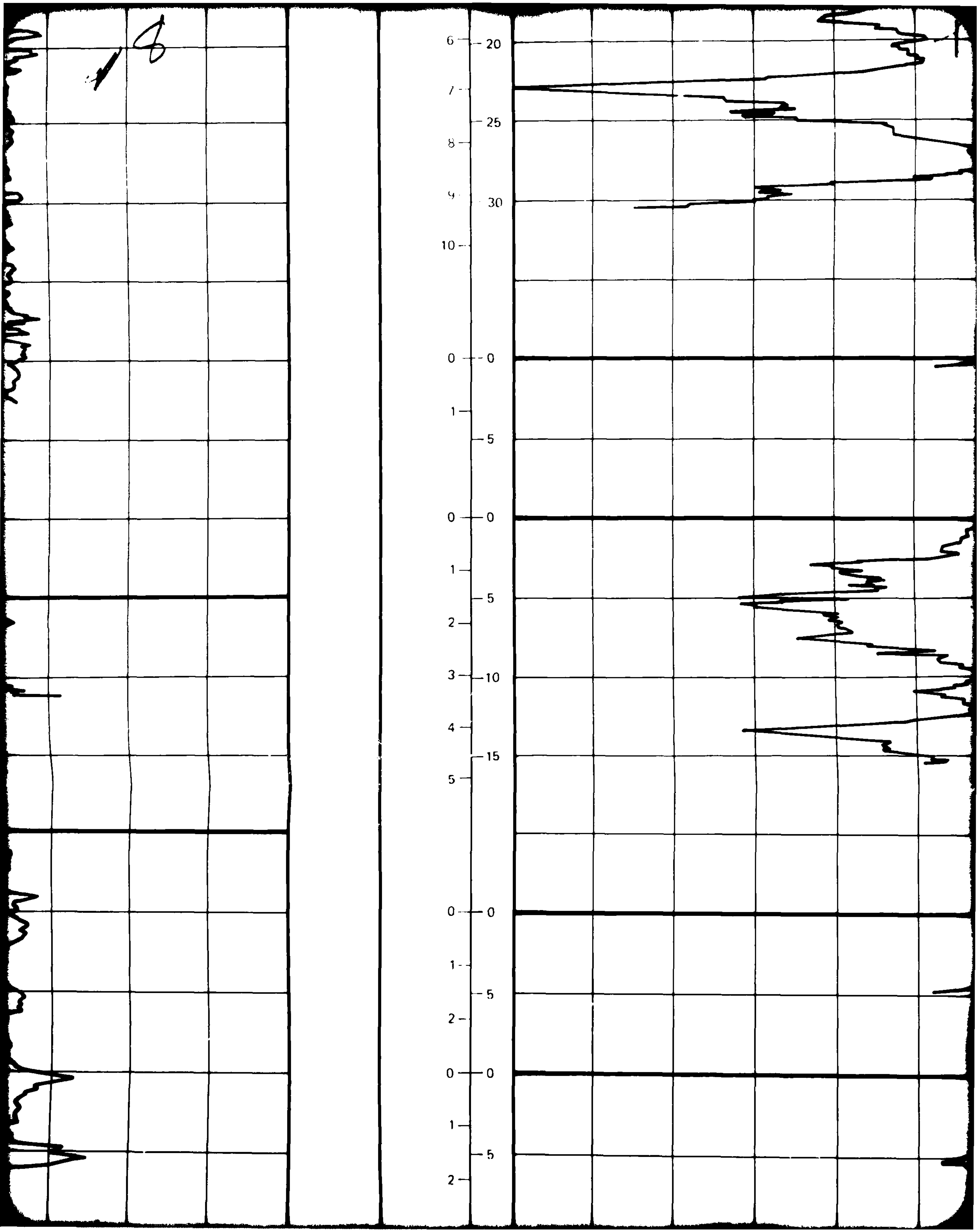

ICE
CONE RESISTANCE
4 2 0 100 200 300 400 500 600 700 800 900 (kg/c
4 2 0 100 200 300 400 500 600 700 800 900 (tsf)
C-56 SURFACE ELEVATION 5530' (1686m)
SURFICIAL GEOLOGIC UNIT: A5y/A5i
C-57 SURFACE ELEVATION 5445' (1660m)
SURFICIAL GEOLOGIC UNIT: A5i

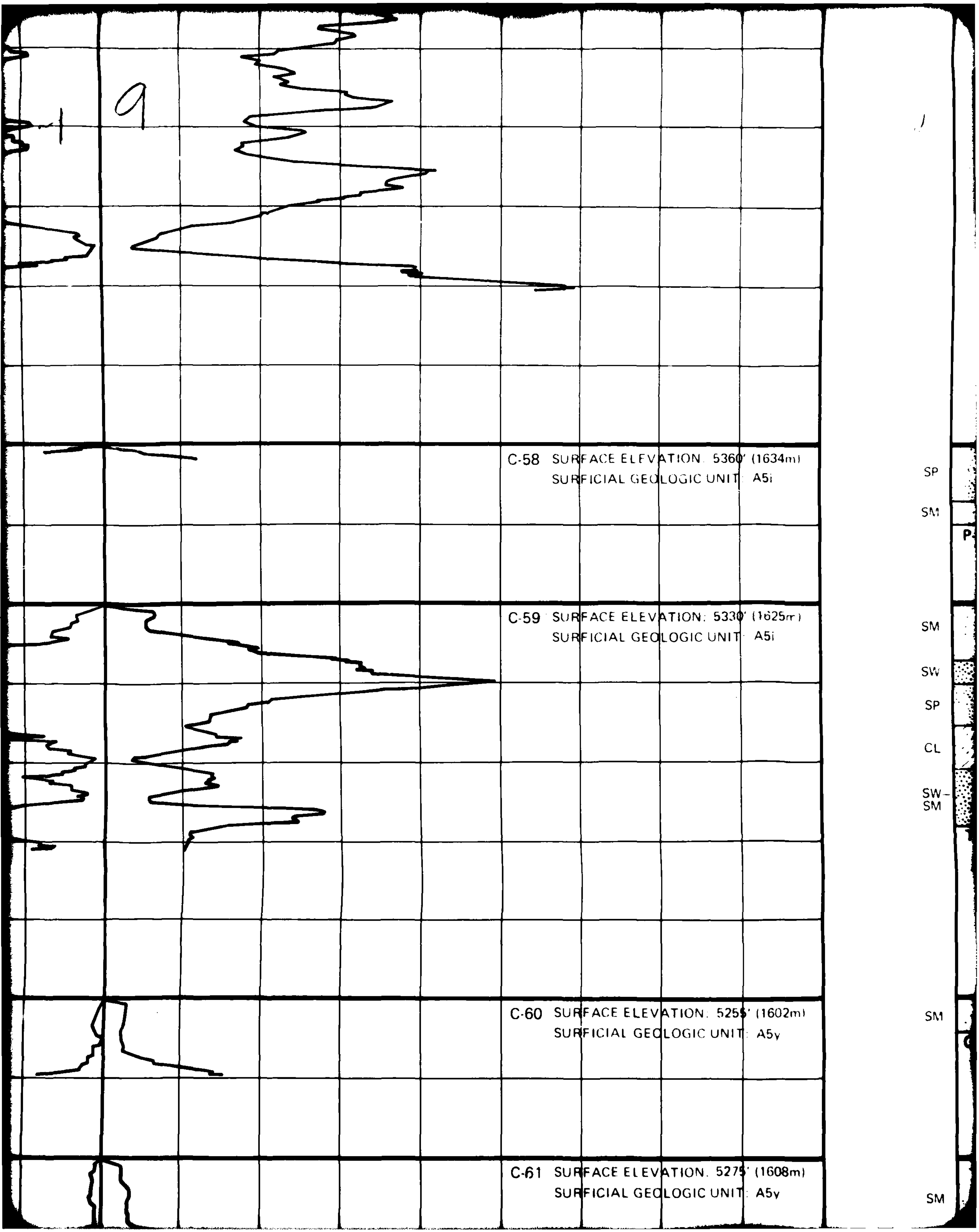


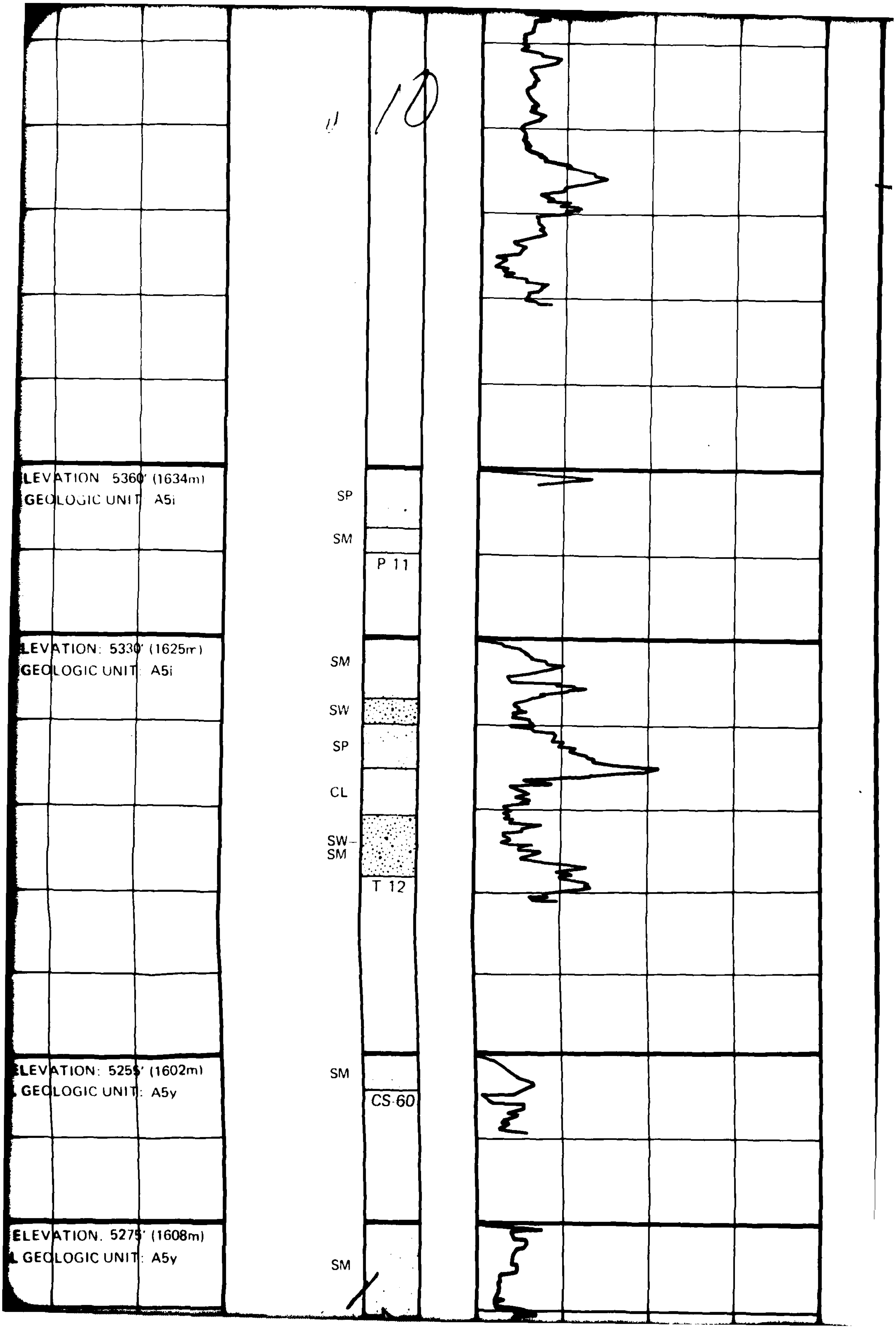
FRICTION RATIO
800
900 (kg/cm2)
900 (tsf)
SOIL COLUMN
0
2
4
6
8 (%)
(1686m)
: A5y/A5i
SM
P-12
5445' (1660m)
UNIT: A5i
SM
CS-57

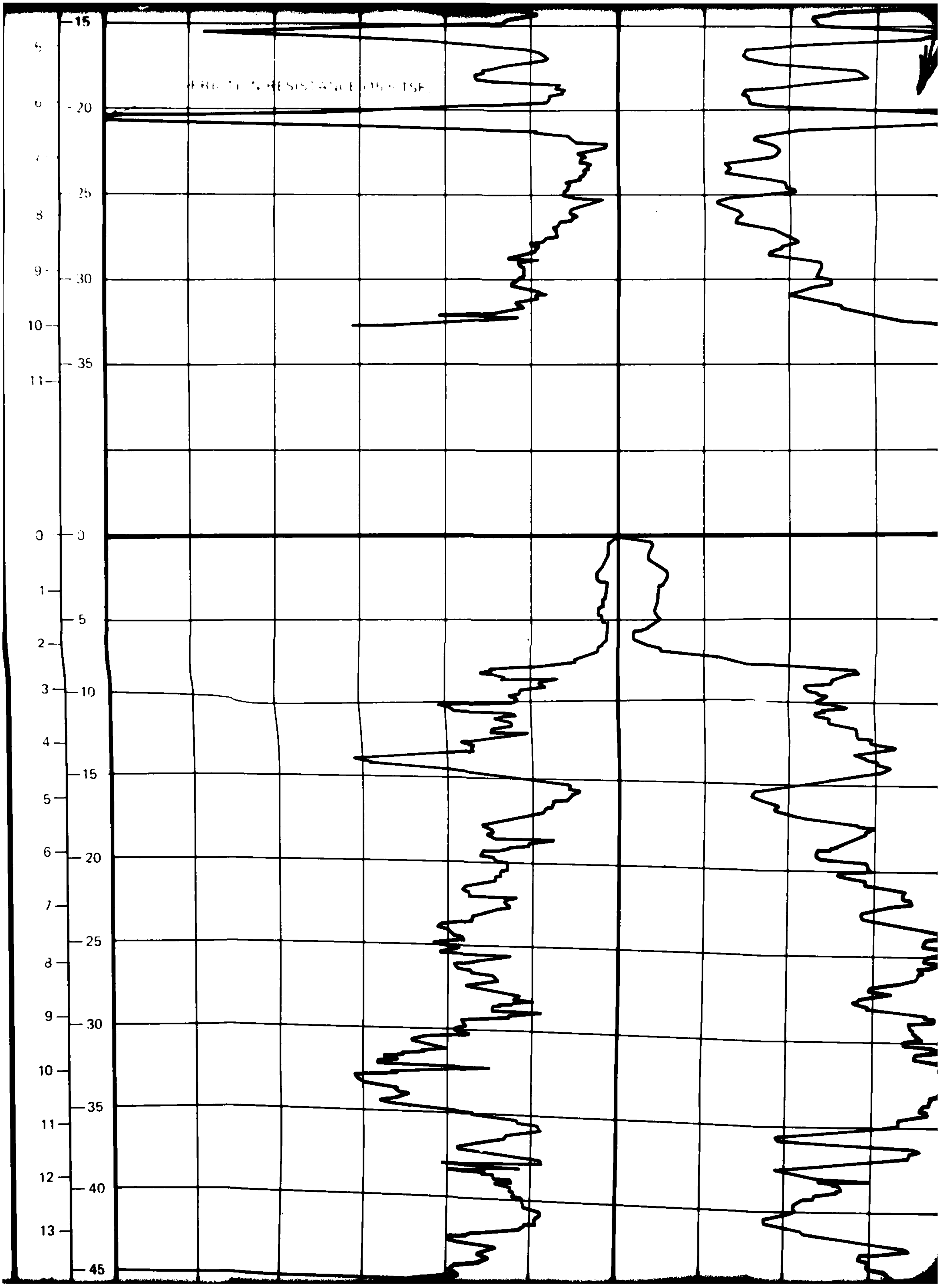

FRICTION RESISTANCE (15.5 TSF)


T 8
C-53 SURFACE ELEVATION: 5855' (1785m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS 53
C-54 SURFACE ELEVATION: 5740' (1750m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SW - SM
P 13


6 20
7
25
8
9 30
10
0 0
1
5
0 0
1
5
2
3 10
4
15
5
0 0
1
5
2
0 0
1
5
2


9
C-58 SURFACE ELEVATION: 5360' (1634m)
SURFICIAL GEOLOGIC UNIT: A5i
SP
SM
C-59 SURFACE ELEVATION: 5330' (1625m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SW
SP
CL
SW–SM
C-60 SURFACE ELEVATION: 5255' (1602m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
C-61 SURFACE ELEVATION: 5275' (1608m)
SURFICIAL GEOLOGIC UNIT: A5y
SM


10
ELEVATION 5360' (1634m)
GEOLOGIC UNIT A5i
SP
SM
P 11
ELEVATION: 5330' (1625m)
GEOLOGIC UNIT A5i
SM
SW
SP
CL
SW–SM
T 12
ELEVATION: 5255' (1602m)
GEOLOGIC UNIT: A5y
SM
CS-60
ELEVATION. 5275' (1608m)
GEOLOGIC UNIT: A5y
SM



15
20
25
30
35
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9
10
11
0
5
10
15
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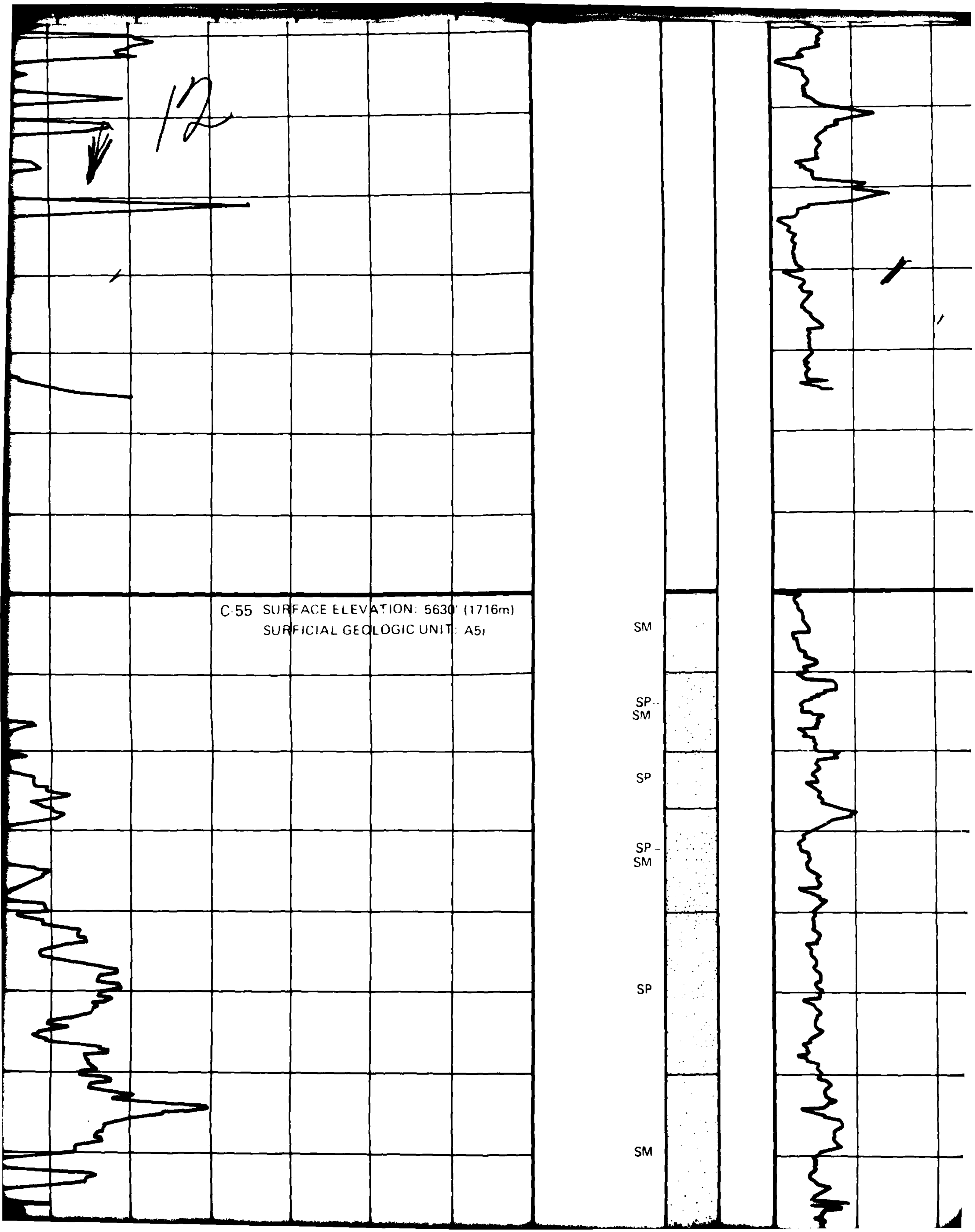
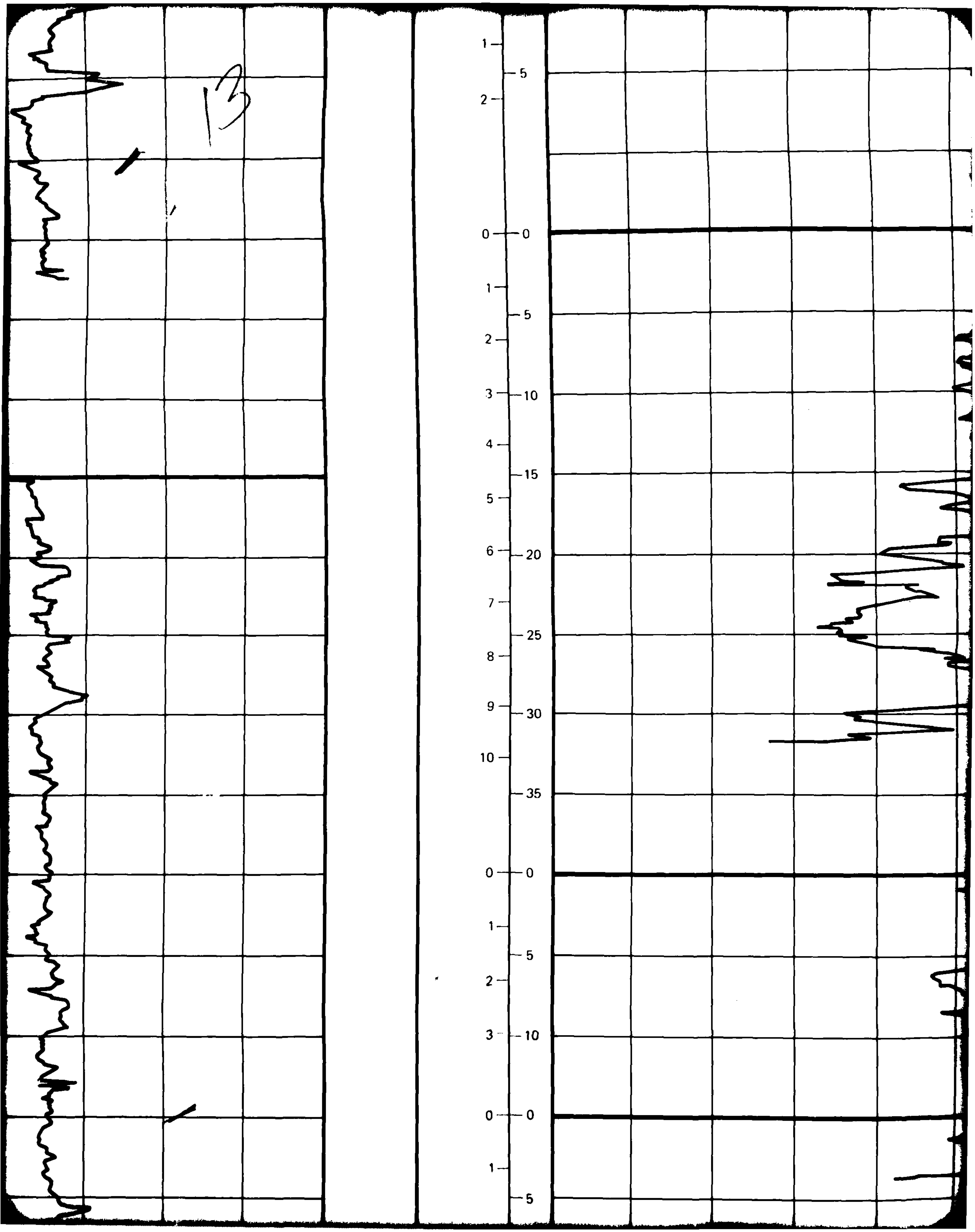
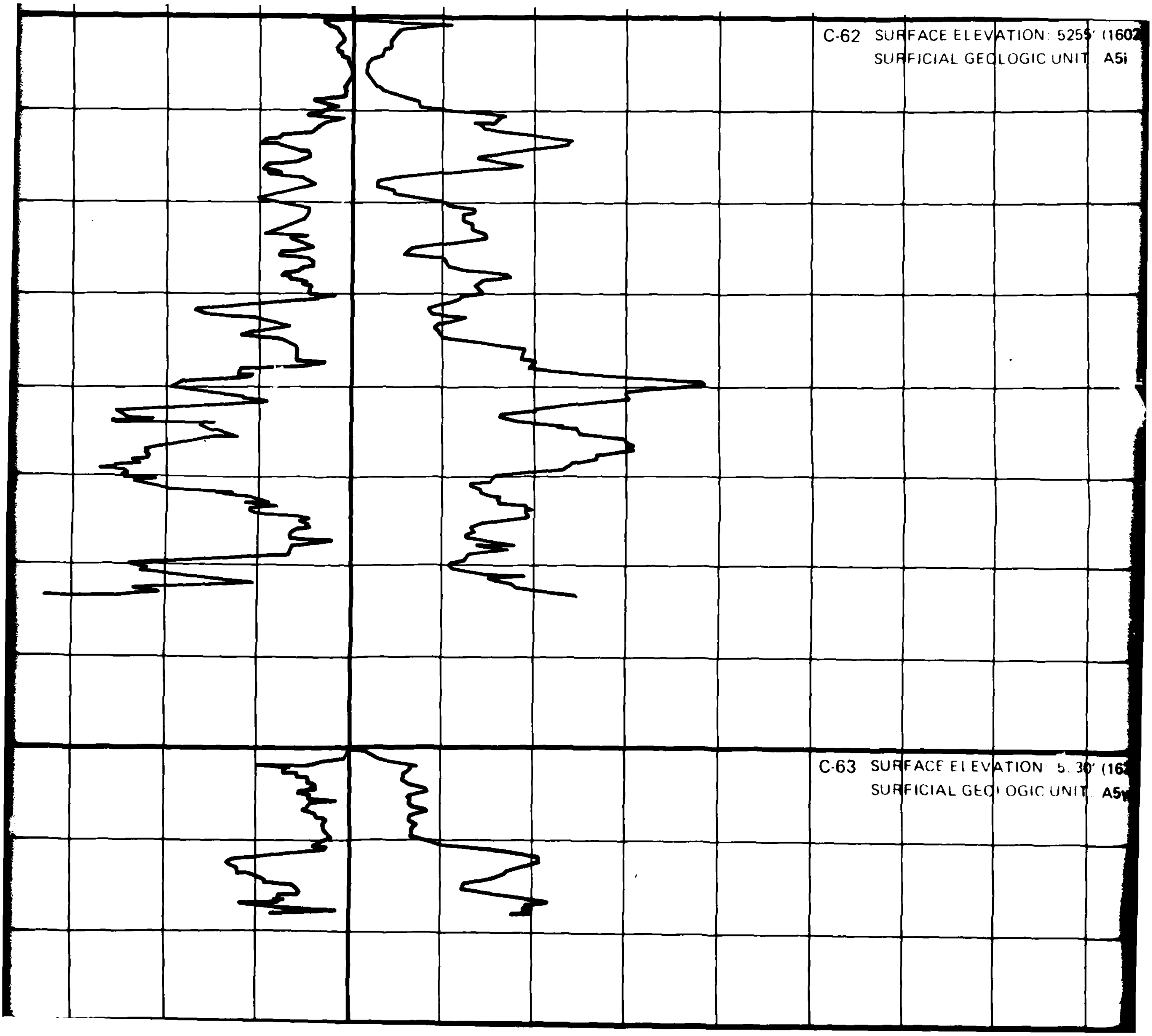
9
10
11
12
13


12
C-55 SURFACE ELEVATION: 5630' (1716m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SP-SM
SP
SP-SM
SP
SM


13
1
5
2
0 0
1
5
2
3 10
4
15
5
6 20
7
25
8
9 30
10
35
0 0
1
5
2
3 10
0 0
1
5

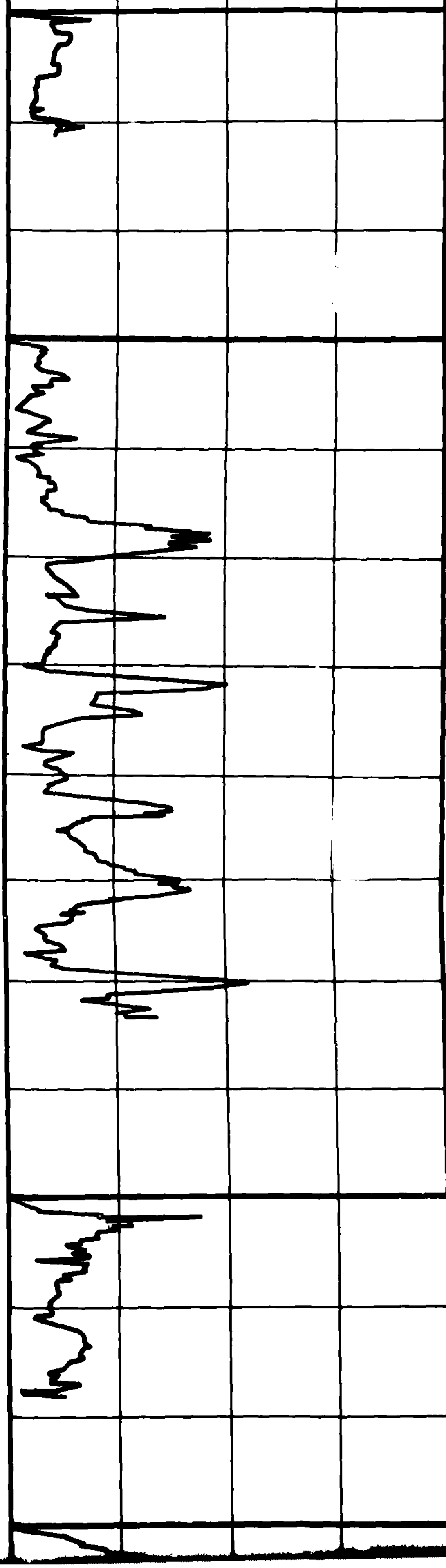

C-62 SURFACE ELEVATION: 5255' (1602
SURFICIAL GEOLOGIC UNIT A5i
C-63 SURFACE ELEVATION: 5. 30' (16
SURFICIAL GEOLOGIC UNIT A5

15

ACE ELEVATION: 5275' (1608m)
ICIAL GEOLOGIC UNIT: A5y

SM

B-2



ACE ELEVATION: 5255' (1602m)
ICIAL GEOLOGIC UNIT: A5i

SP
SM
SP

P-8

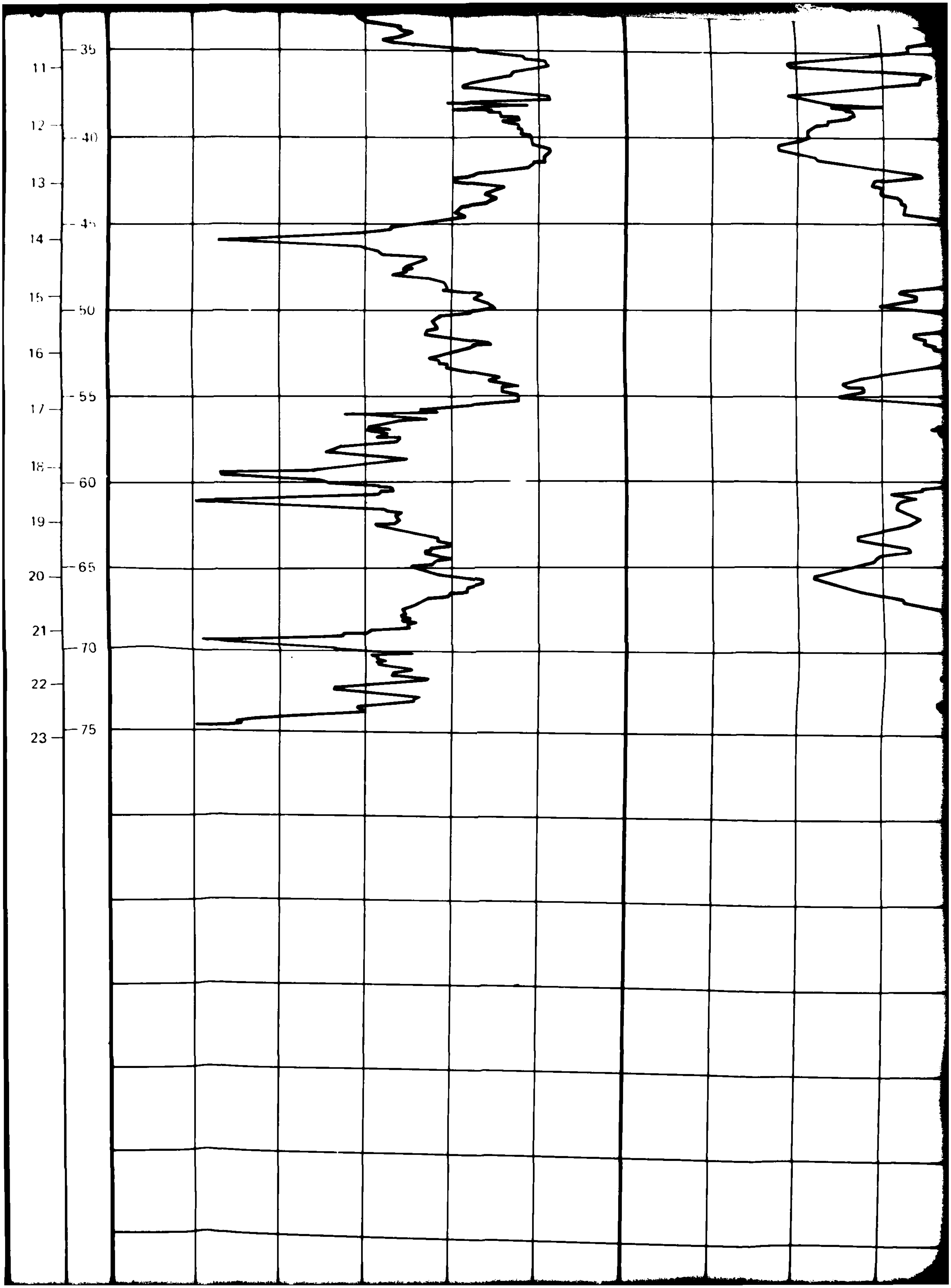
CE ELEVATION: 5330' (1625m)
IAL GEOLOGIC UNIT: A5y

SM

CS-63

E ELEVATION: 5430' (1665m)

SM


35
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12
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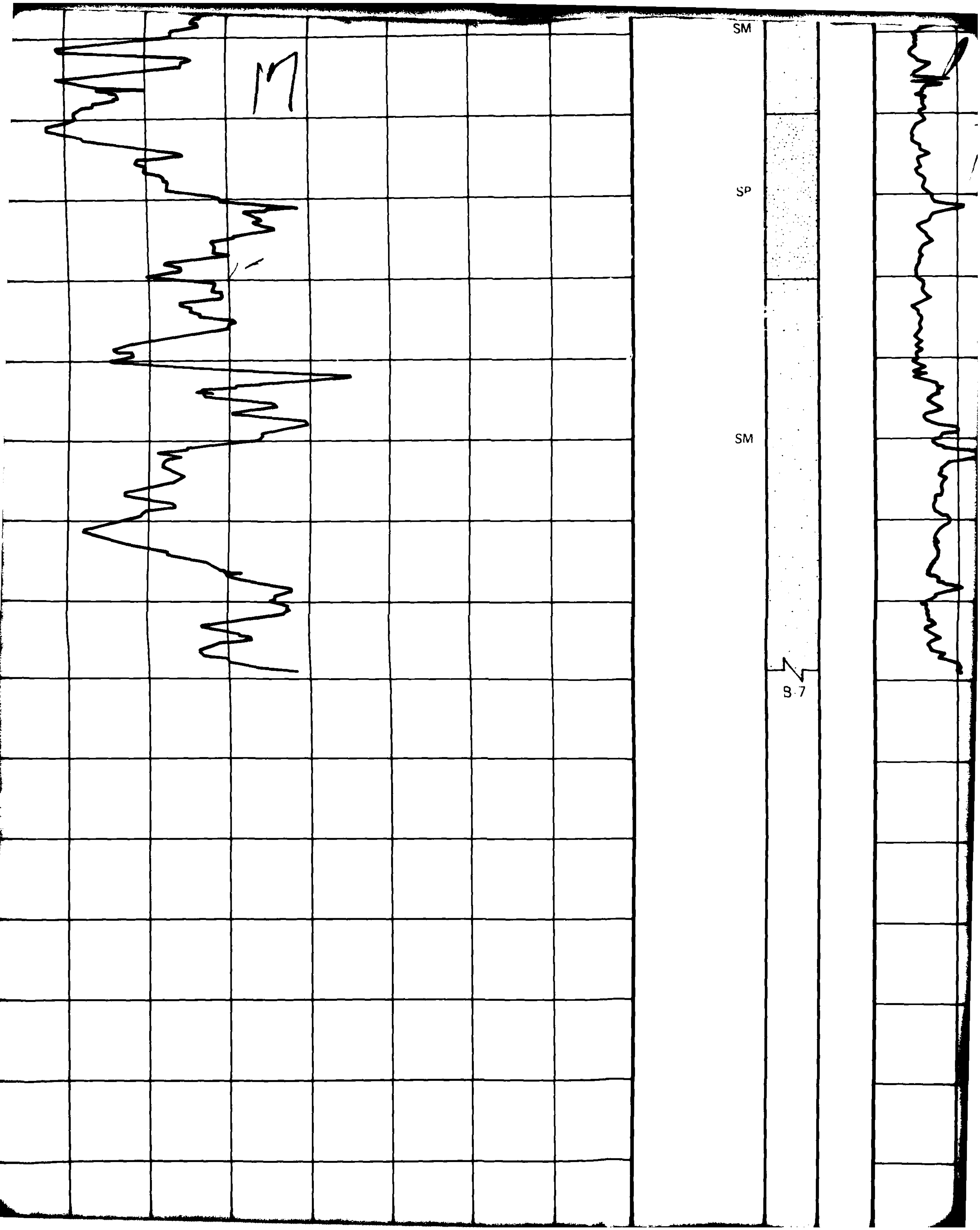
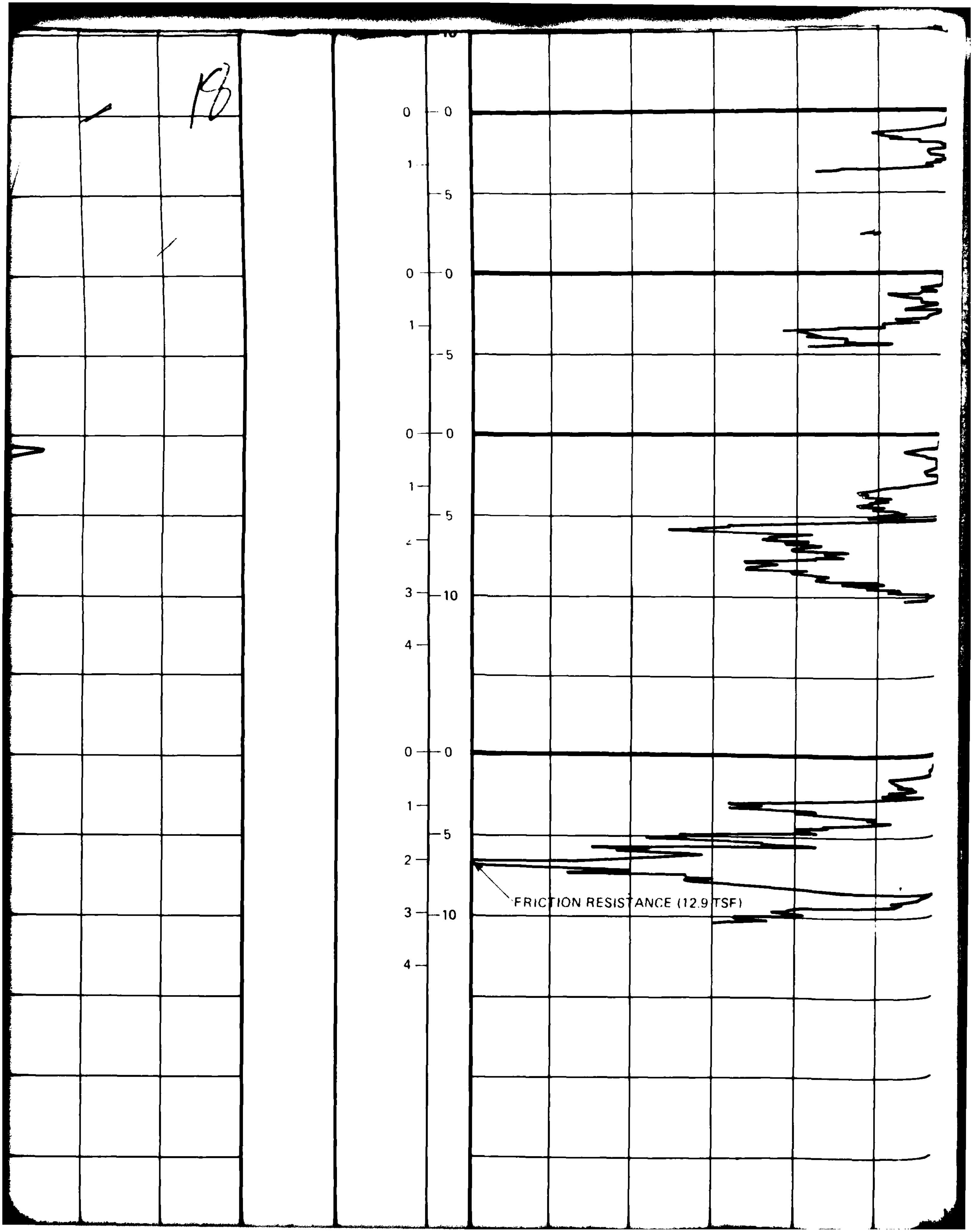
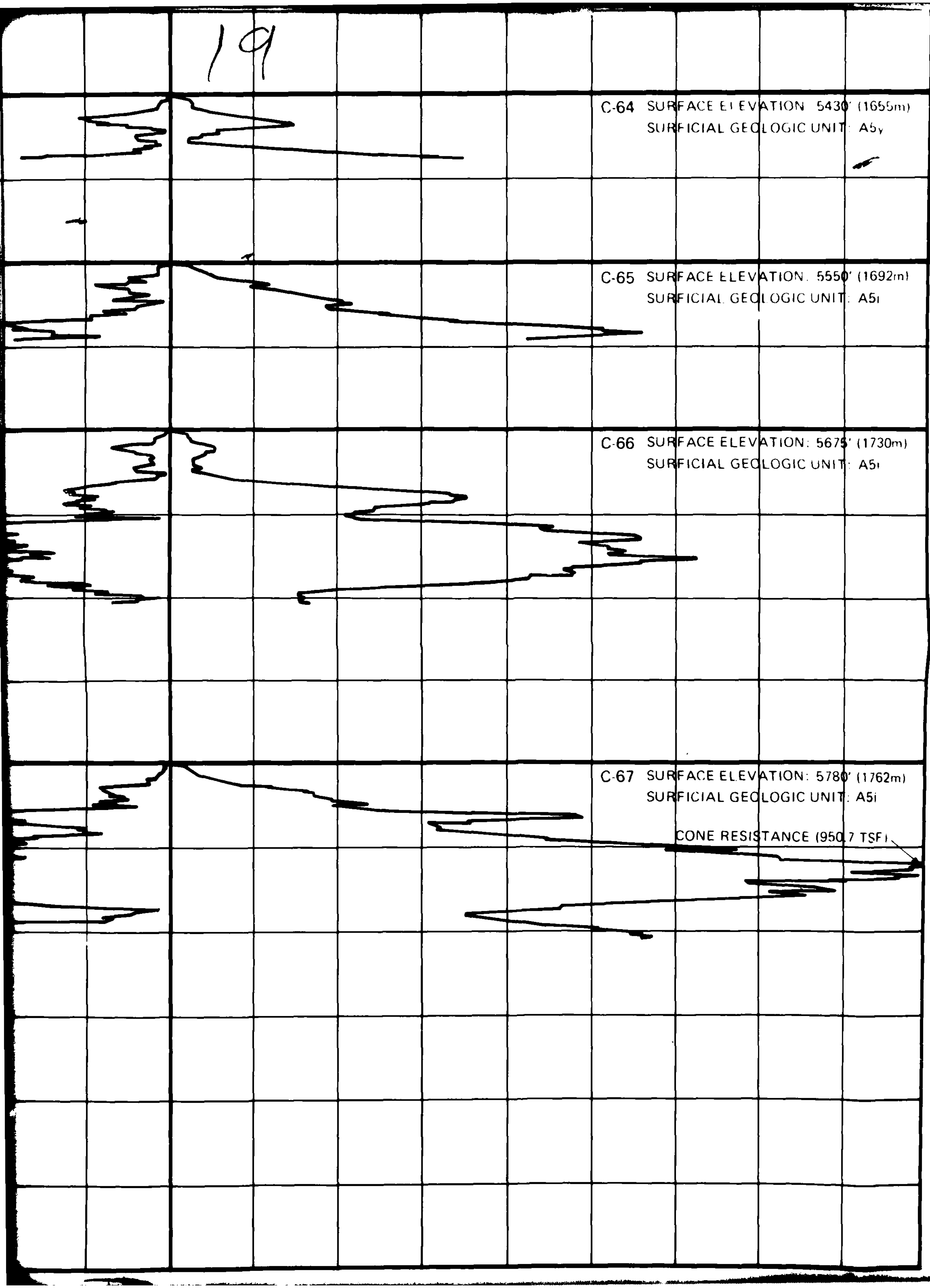
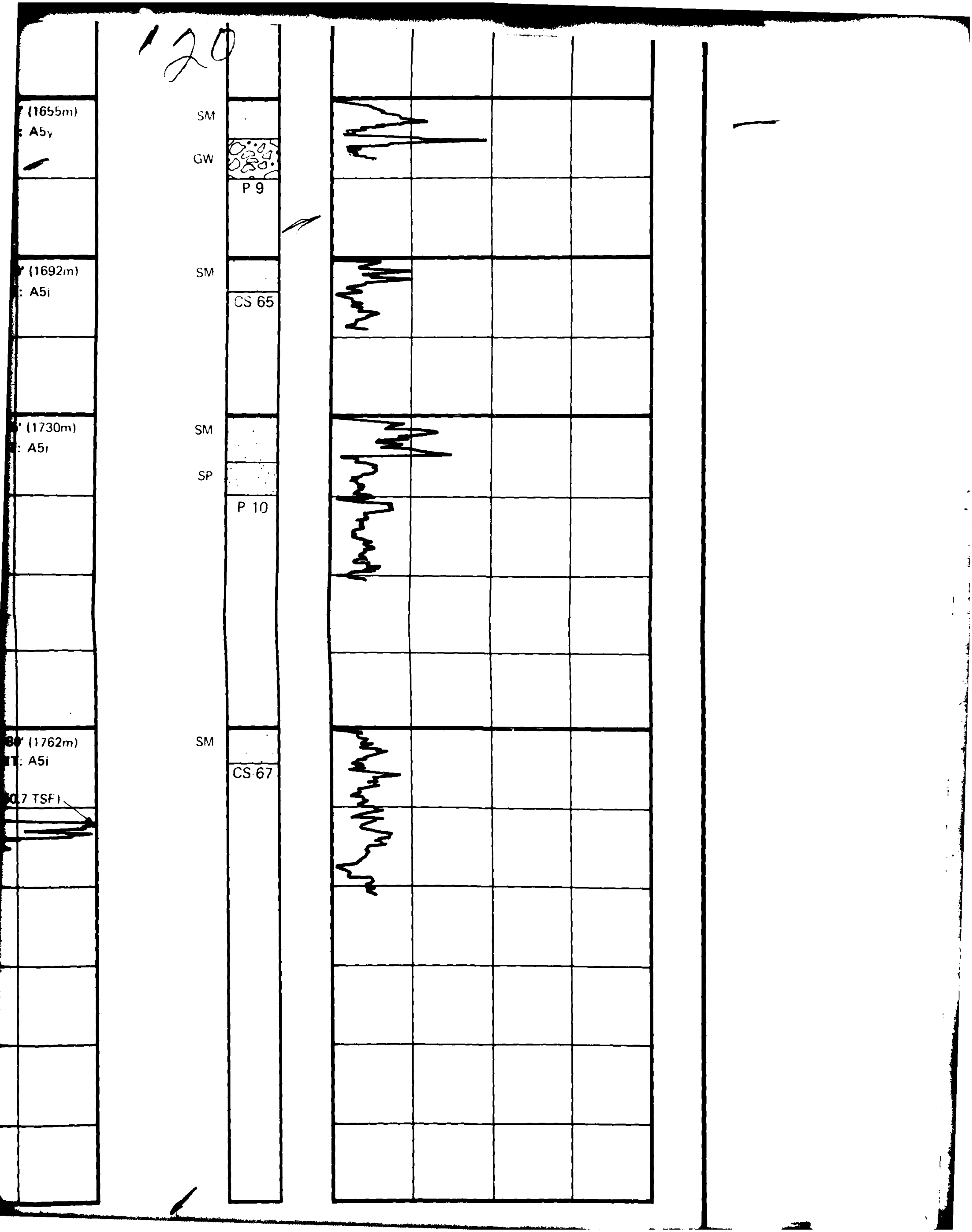
14
15
50
16
55
17
18
60
19
65
20
21
70
22
75
23

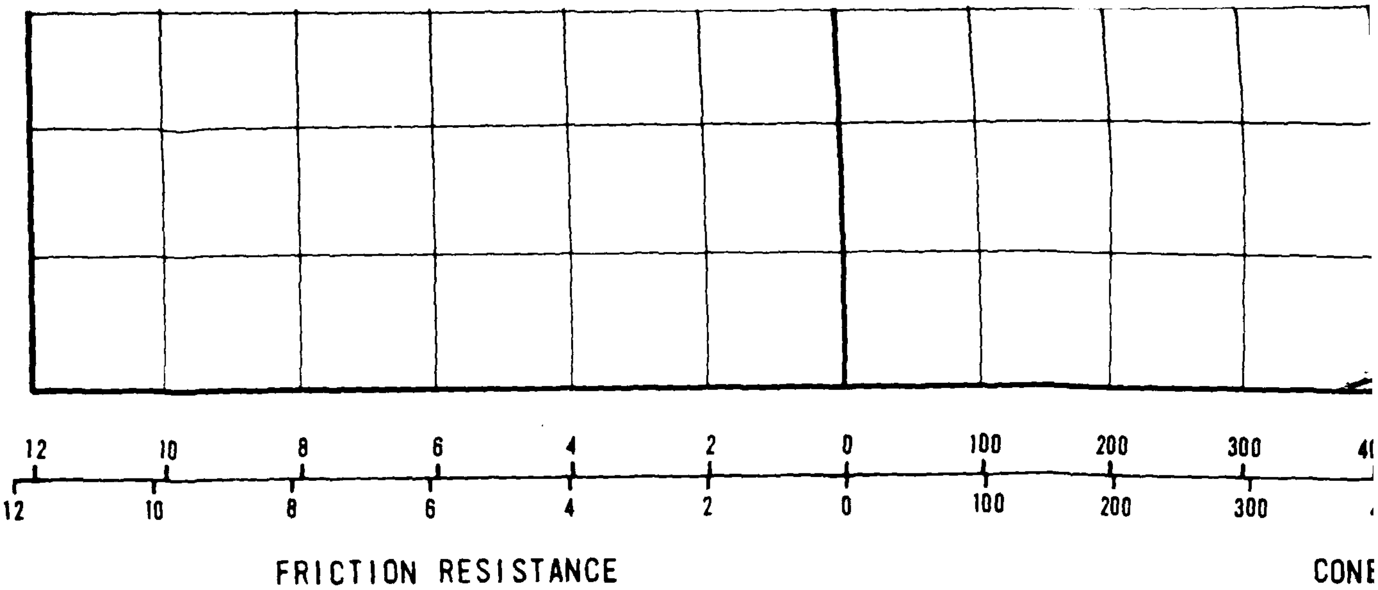

M
SM
SP
SM
B-7



0
1
0
1
0
1
2
3
4
0
1
2
3
4
0
5
0
5
0
5
10
0
5
10
FRICTION RESISTANCE (12.9 TSF)

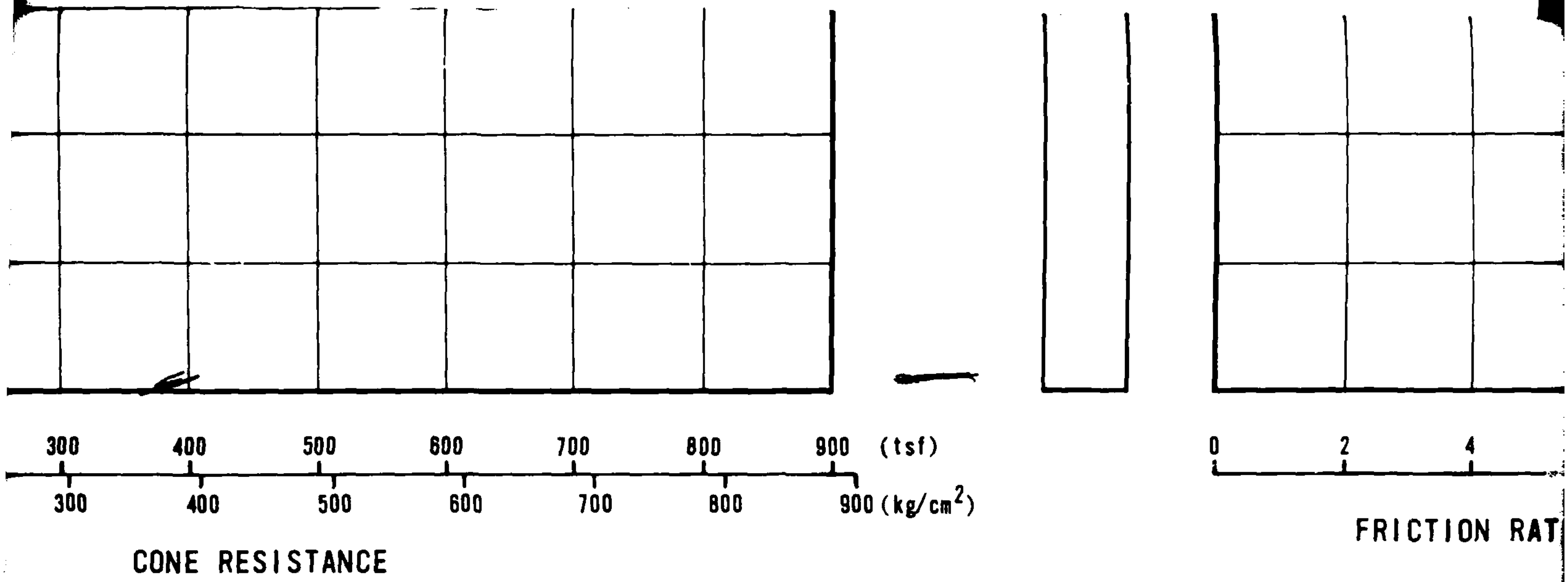

19
C-64 SURFACE ELEVATION 5430' (1655m)
SURFICIAL GEOLOGIC UNIT: A5y
C-65 SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5i
C-66 SURFACE ELEVATION: 5675' (1730m)
SURFICIAL GEOLOGIC UNIT: A5i
C-67 SURFACE ELEVATION: 5780' (1762m)
SURFICIAL GEOLOGIC UNIT: A5i
CONE RESISTANCE (950.7 TSF)


'20
(1655m)
A5y
SM
GW
P 9
(1692m)
: A5i
SM
CS 65
(1730m)
: A5i
SM
SP
P 10
(1762m)
: A5i
0.7 TSF)
SM
CS-67


12 10 8 6 4 2 0 100 200 300
12 10 8 6 4 2 0 100 200 300
FRICTION RESISTANCE

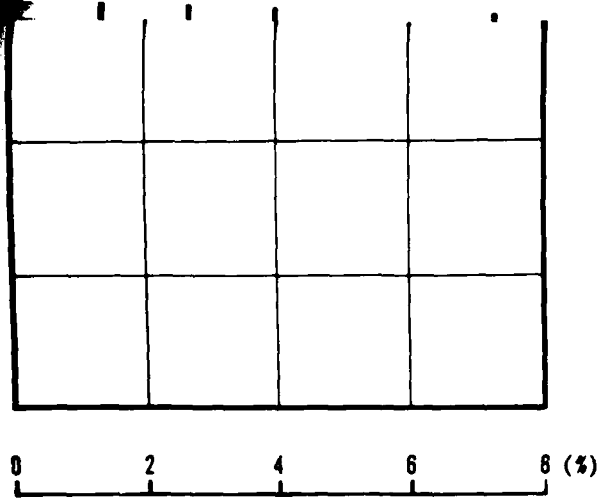
21

24 MAR 81



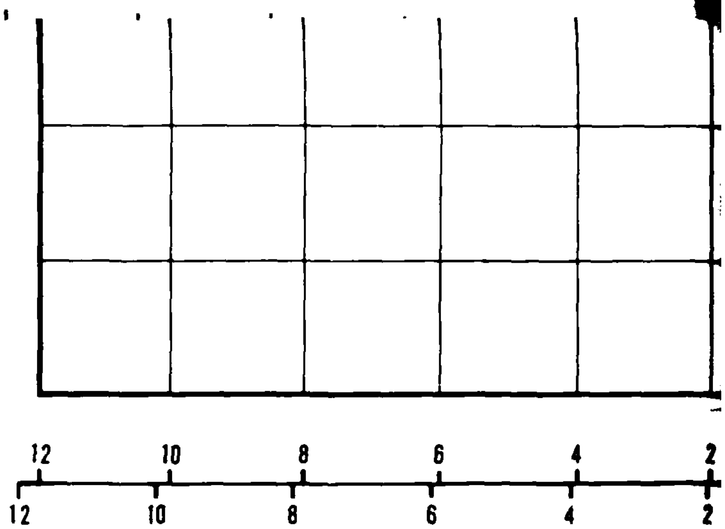
300 400 500 600 700 800 900 (tsf)
300 400 500 600 700 800 900 (kg/cm2)
CONE RESISTANCE
0 2 4
FRICTION RAT

22



FRICTION RATIO

23



FRICTION RESISTANCE

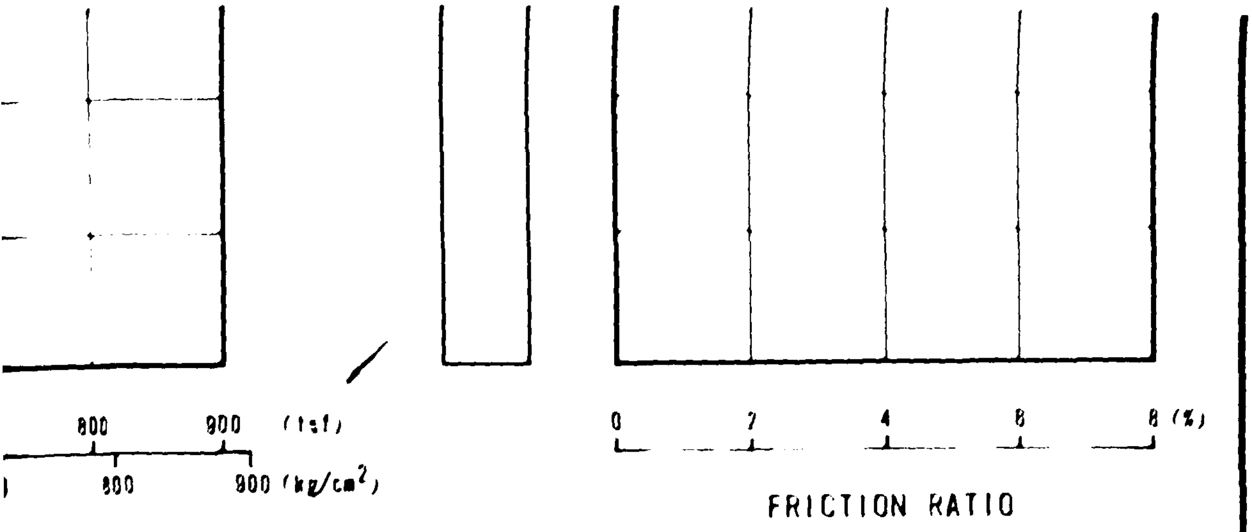
4 2 0 100 200 300 400 500 600 700 800 900 (t

4 2 0 100 200 300 400 500 600 700 800 900 (k

STANCE

CONE RESISTANCE

24

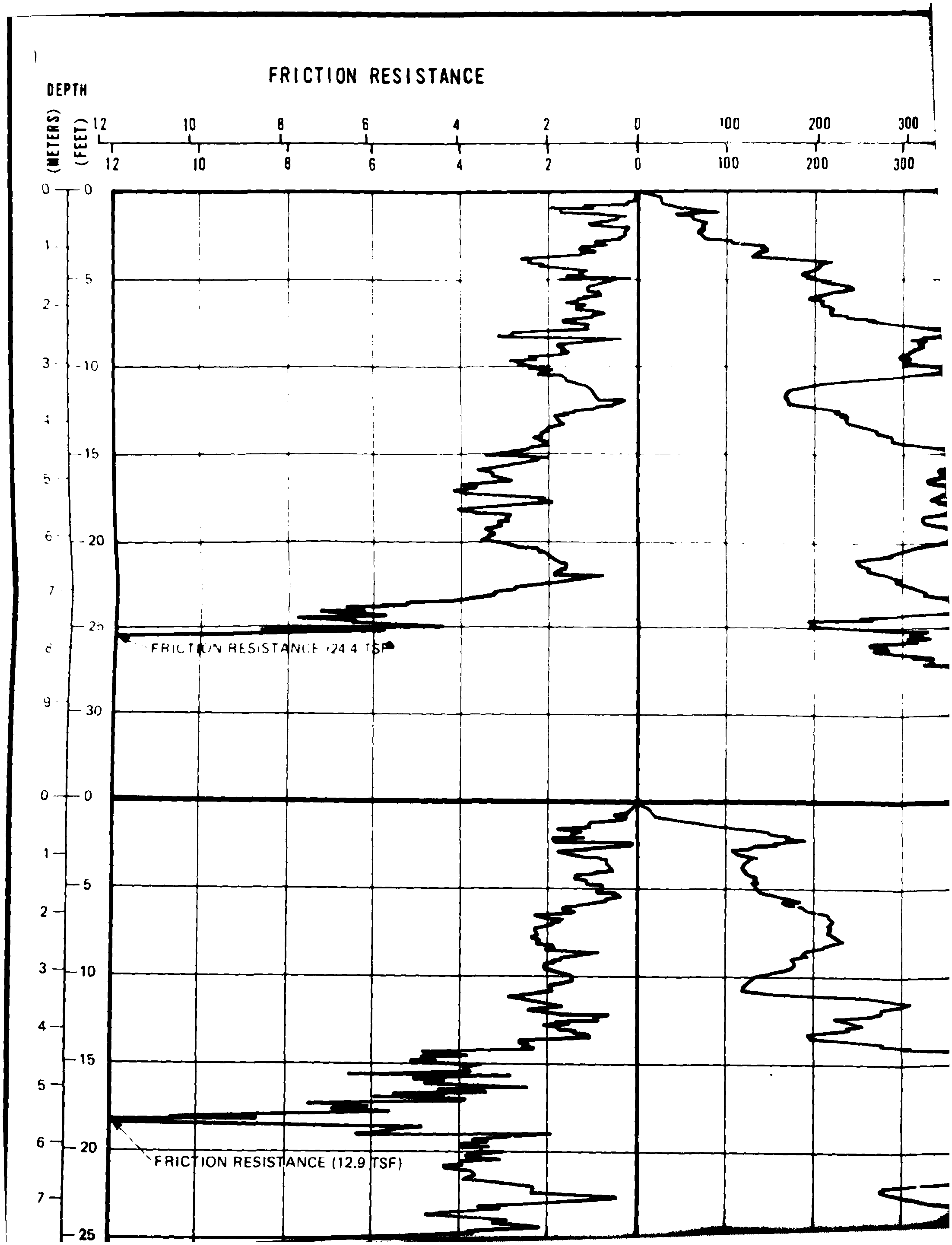


CONE PENETROMETER TEST RESULTS
PINE VALLEY, UTAH

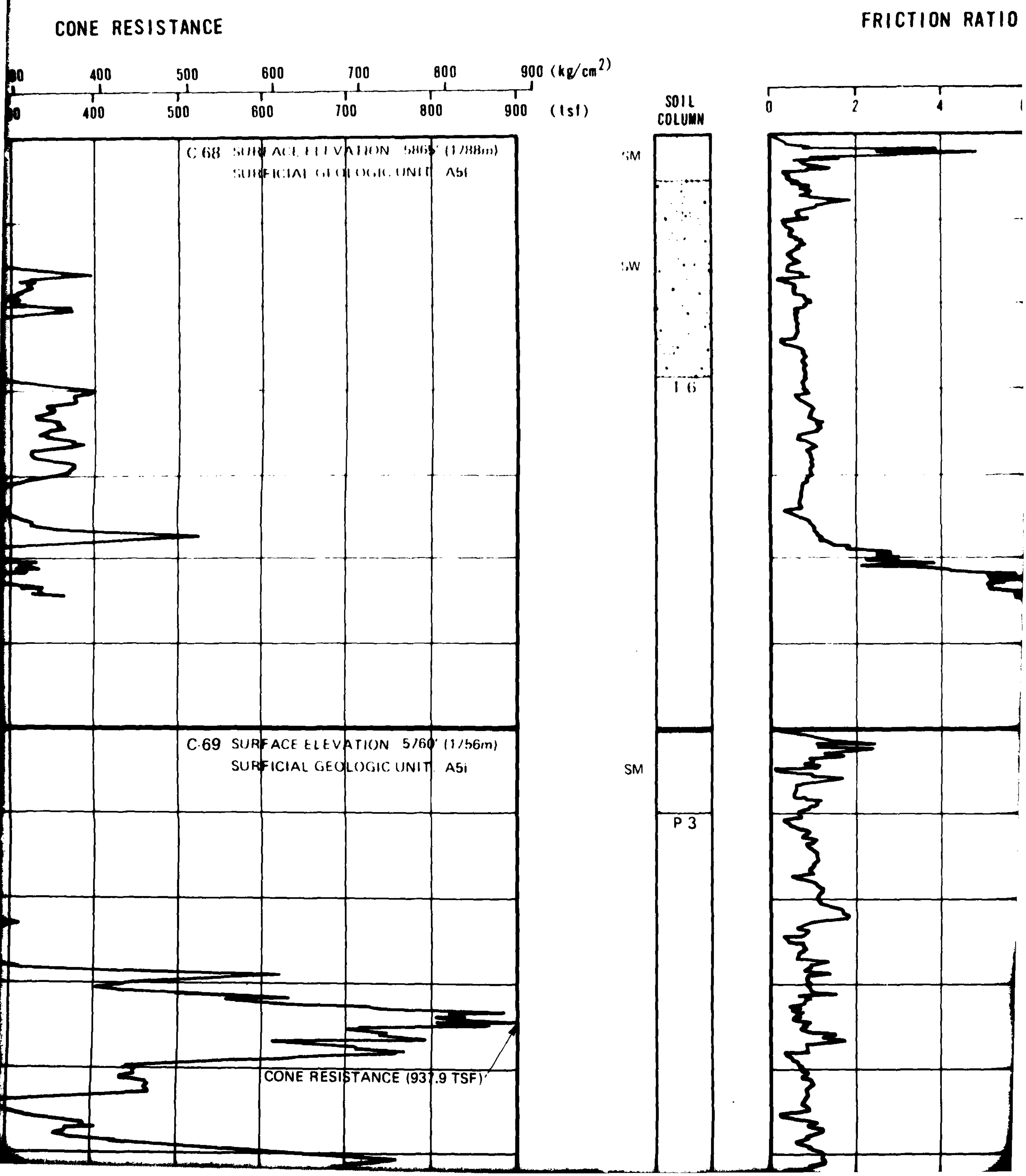
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

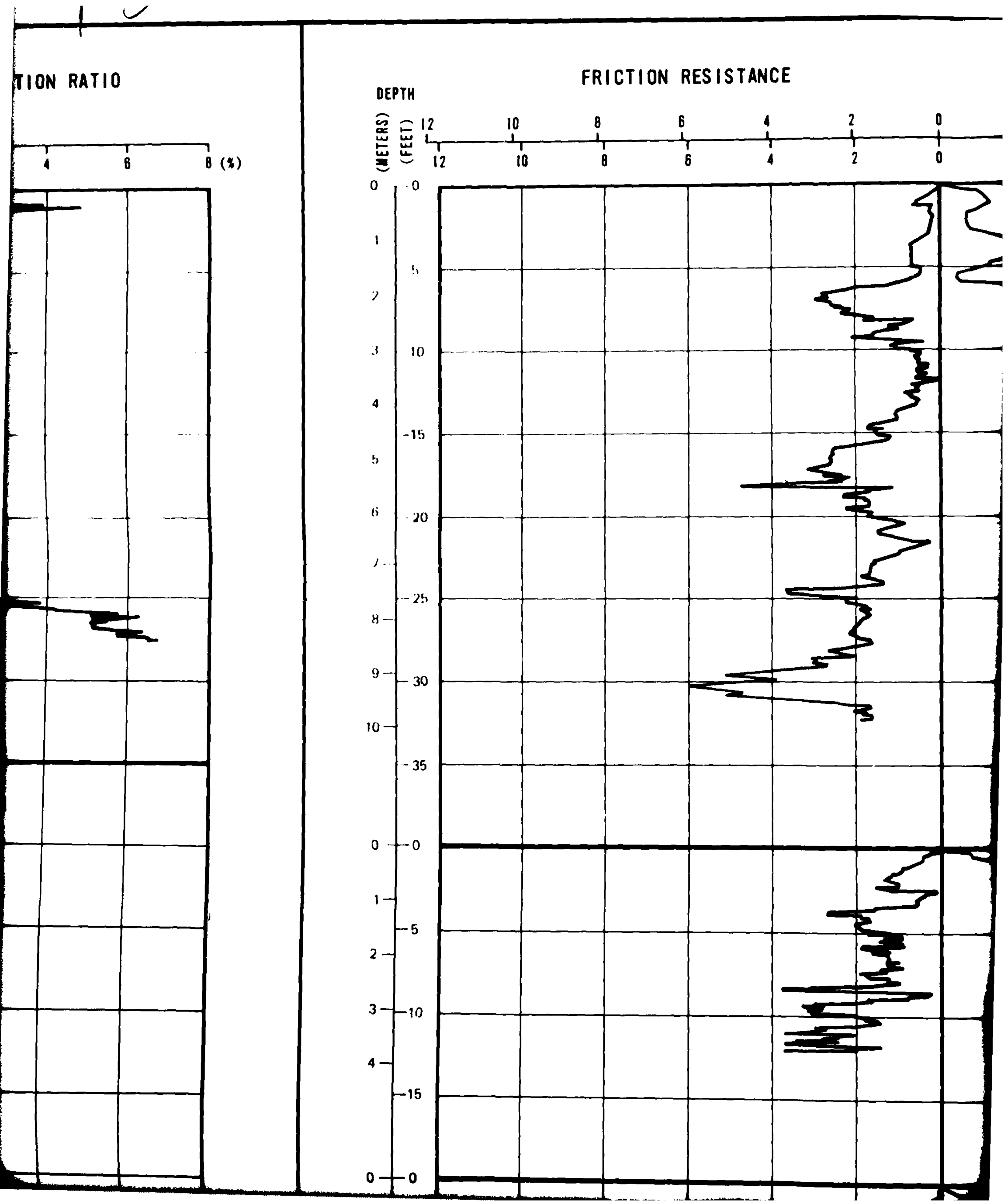
DRAWING
II-10-1

FUGRO NATIONAL, INC.


FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
100
200
300
FRICTION RESISTANCE (24.4 TSF)
FRICTION RESISTANCE (12.9 TSF)

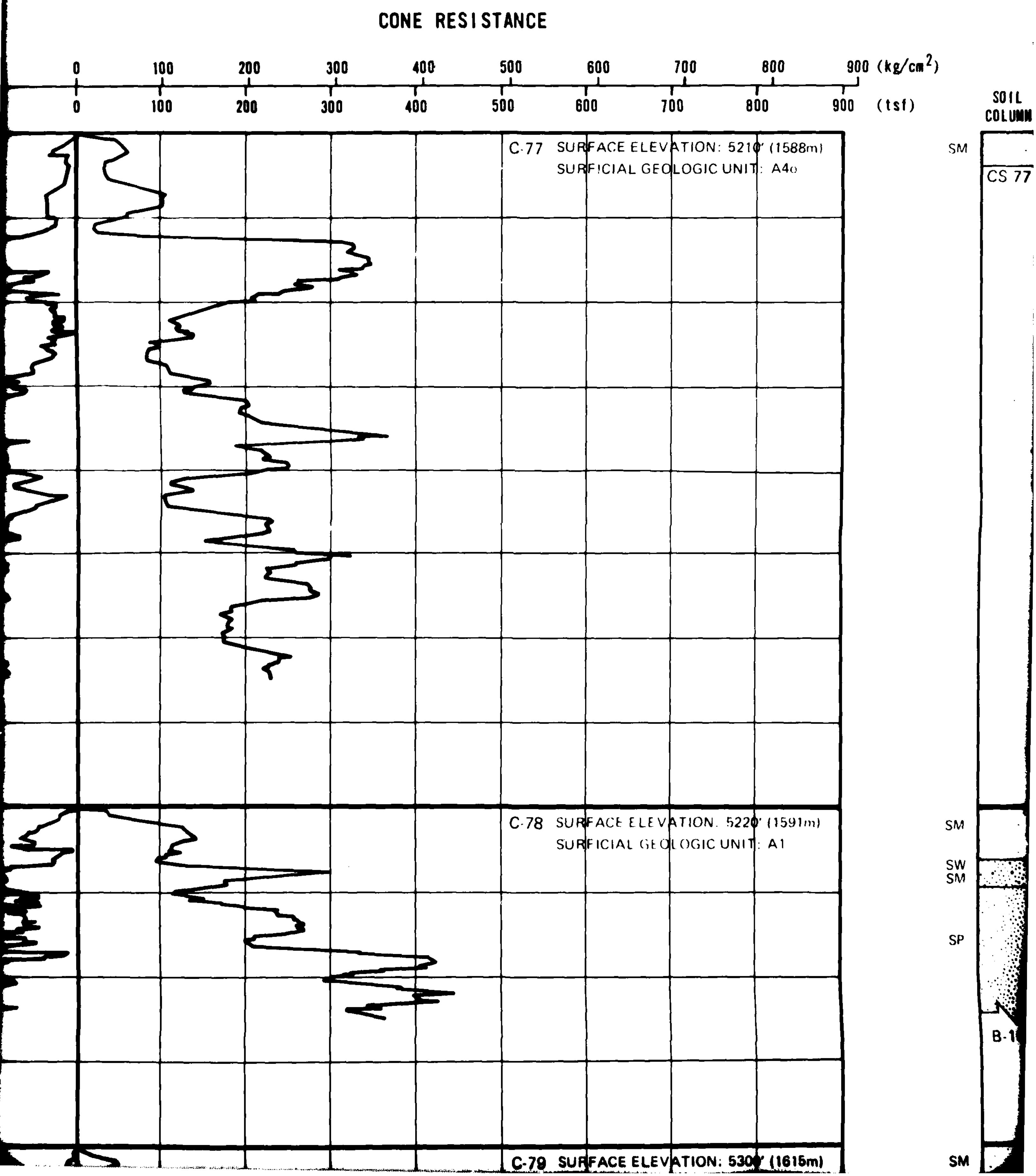
12


CONE RESISTANCE
FRICTION RATIO
400 500 600 700 800 900 (kg/cm2)
400 500 600 700 800 900 (tsf)
SOIL COLUMN
0 2 4
C-68 SURFACE ELEVATION 5865' (1788m)
SURFICIAL GEOLOGIC UNIT A5i
SM
SW
T 6
C-69 SURFACE ELEVATION 5760' (1756m)
SURFICIAL GEOLOGIC UNIT A5i
SM
P 3
CONE RESISTANCE (937.9 TSF)

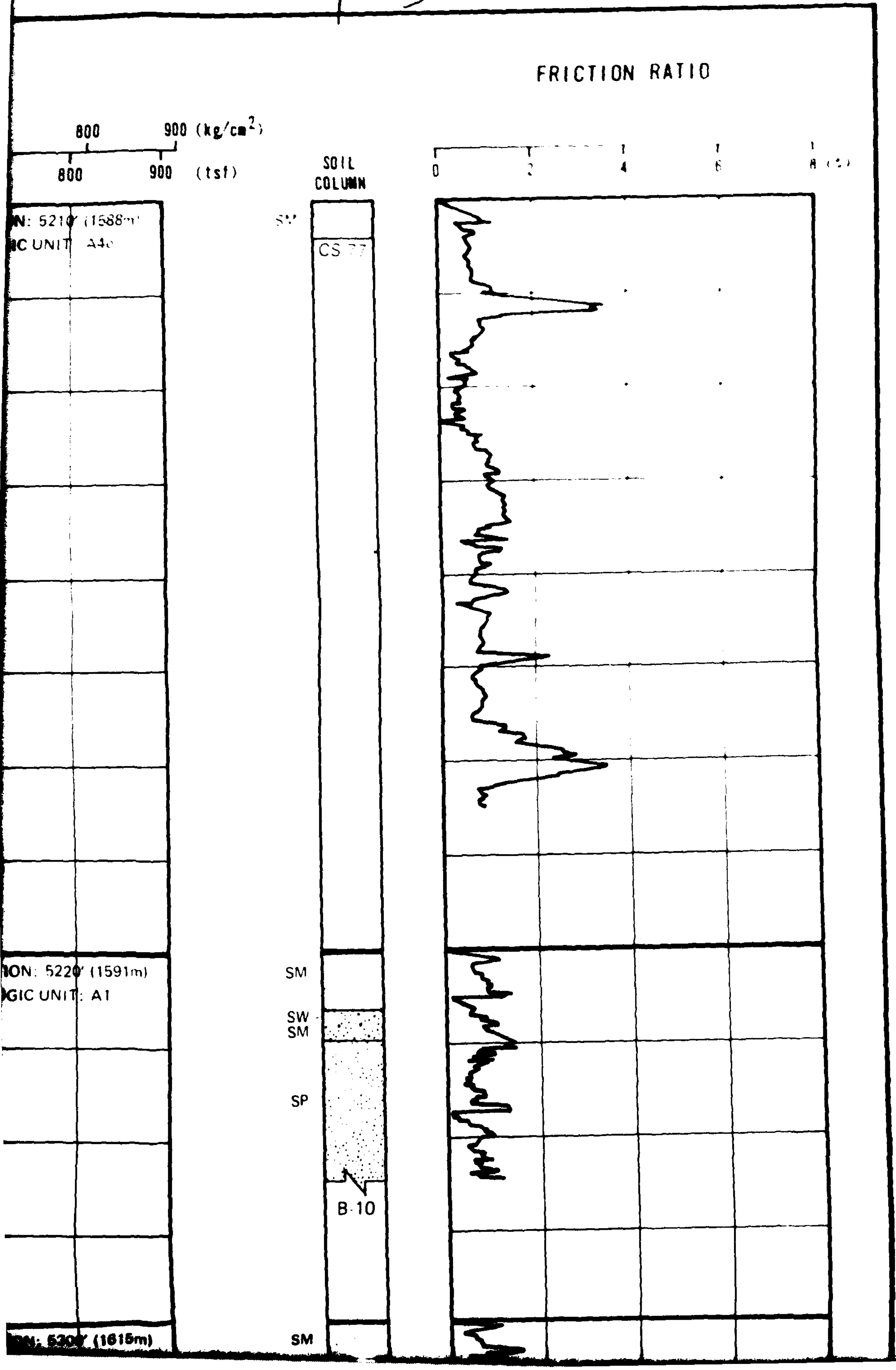


TION RATIO
4
6
8 (%)
FRICTION RESISTANCE
DEPTH
(METERS)
(FEET)
12
10
8
6
4
2
0
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30
35
0
1
2
3
4
0
5
10
15
0
0

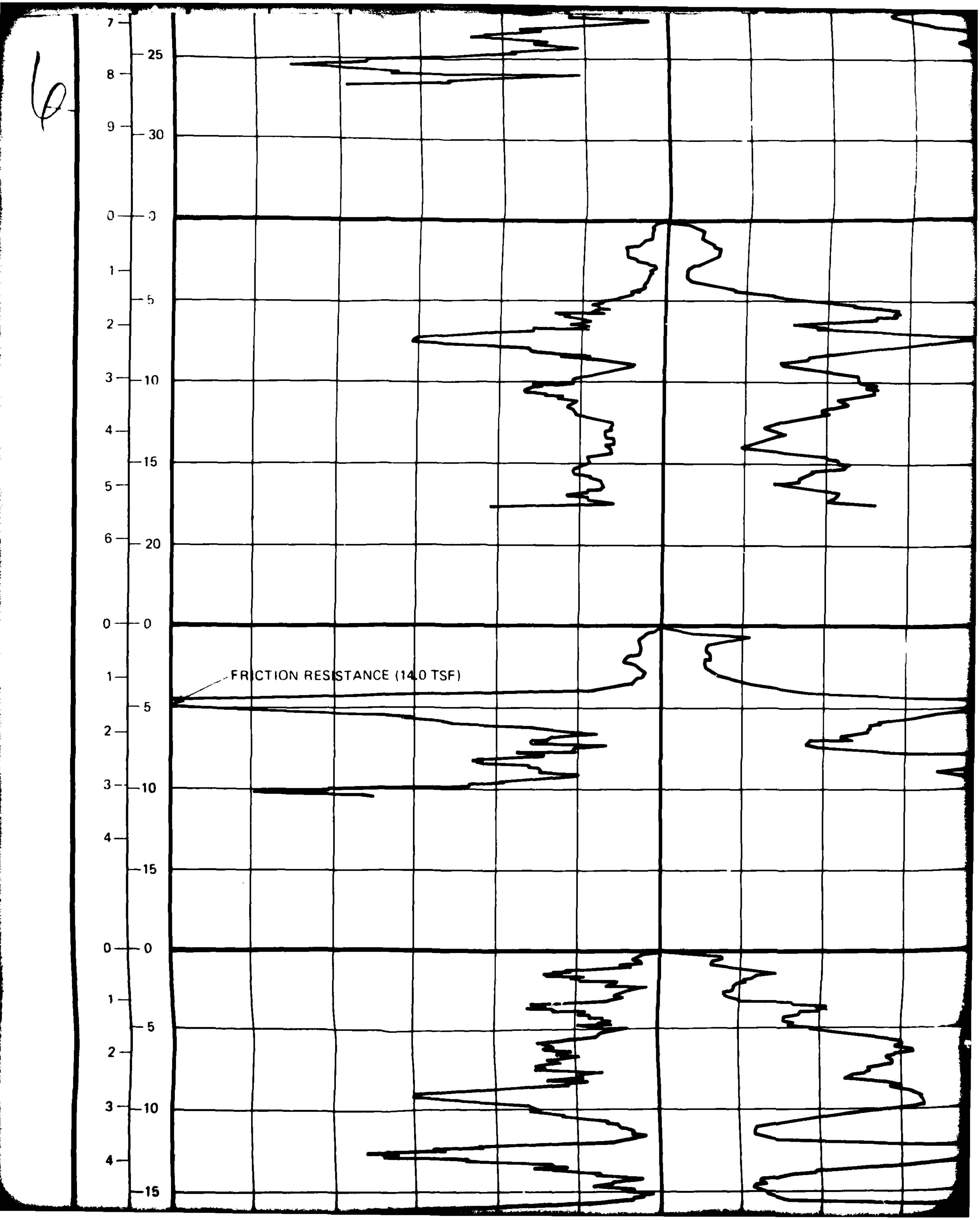
14


CONE RESISTANCE
0 100 200 300 400 500 600 700 800 900 (kg/cm2)
0 100 200 300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
C-77 SURFACE ELEVATION: 5210' (1588m)
SURFICIAL GEOLOGIC UNIT: A4o
SM
CS 77
C-78 SURFACE ELEVATION: 5220' (1591m)
SURFICIAL GEOLOGIC UNIT: A1
SM
SW
SM
SP
B-1
C-79 SURFACE ELEVATION: 5300' (1615m)
SM

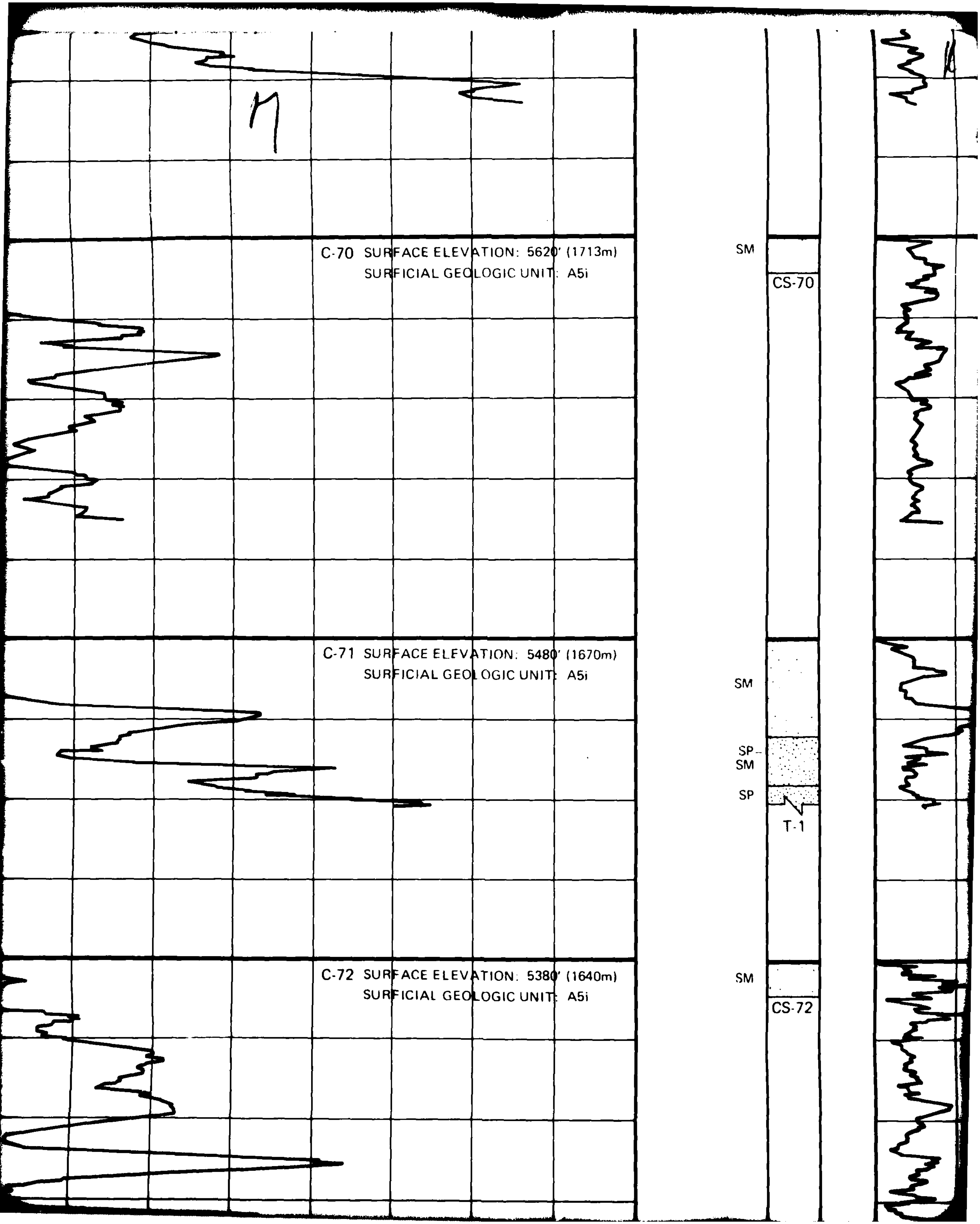
15

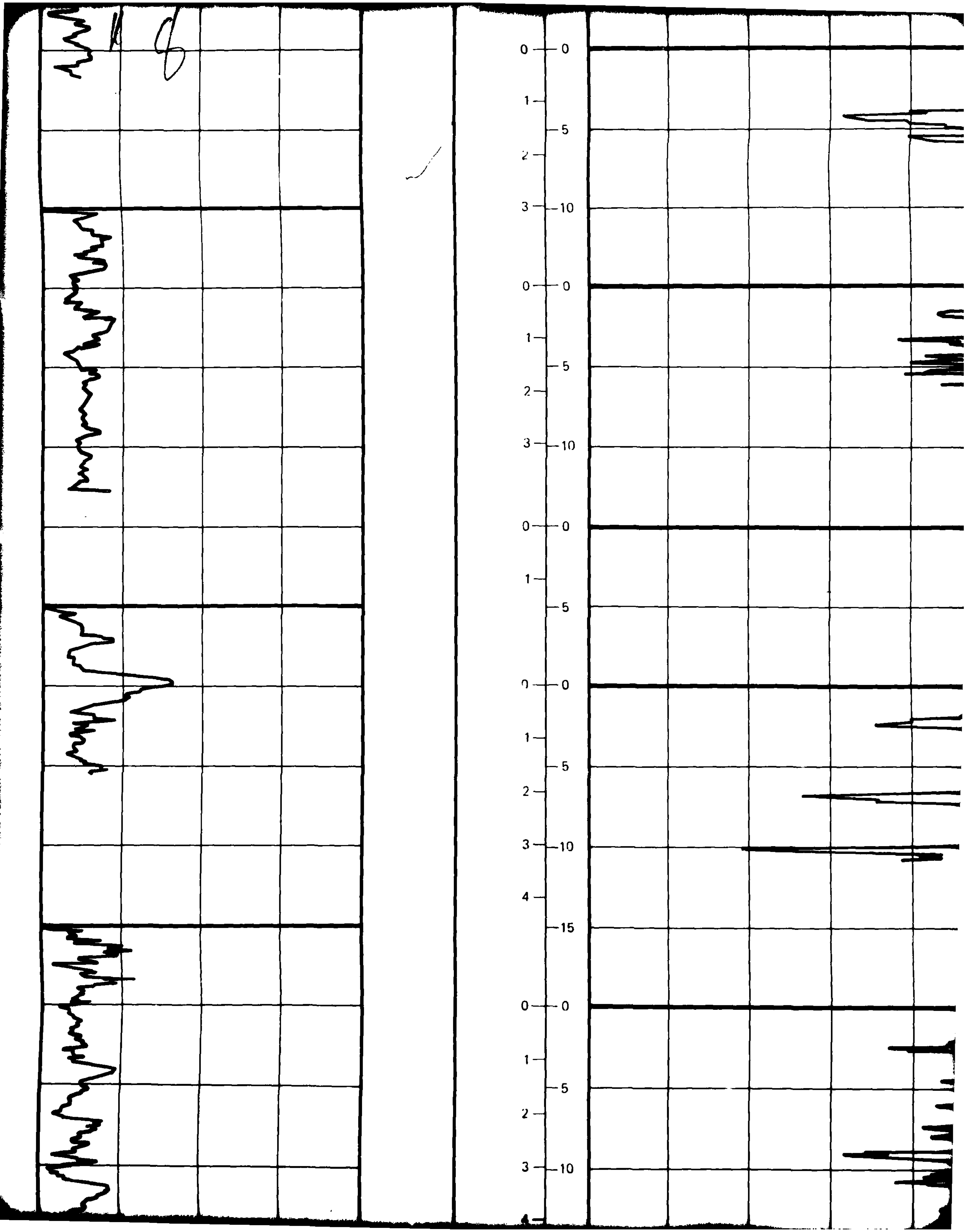


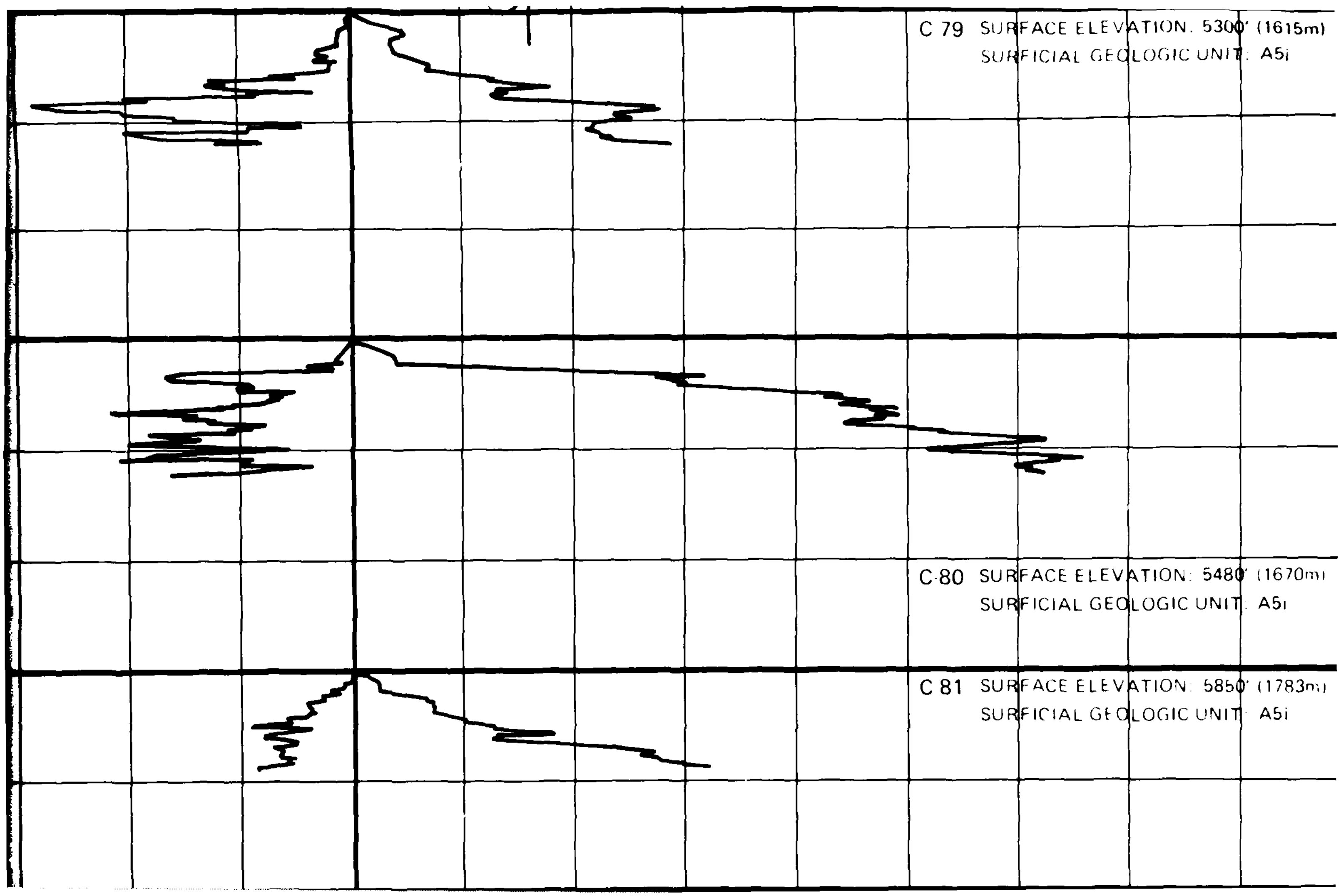
FRICTION RATIO
800
900 (kg/cm²)
800
900 (tsf)
SOIL COLUMN
0
2
4
6
8 (%)
N: 5210' (1588m)
IC UNIT: A4c
CS-77
ION: 5220' (1591m)
GIC UNIT: A1
SM
SW - SM
SP
B-10
ON: 5300' (1615m)
SM



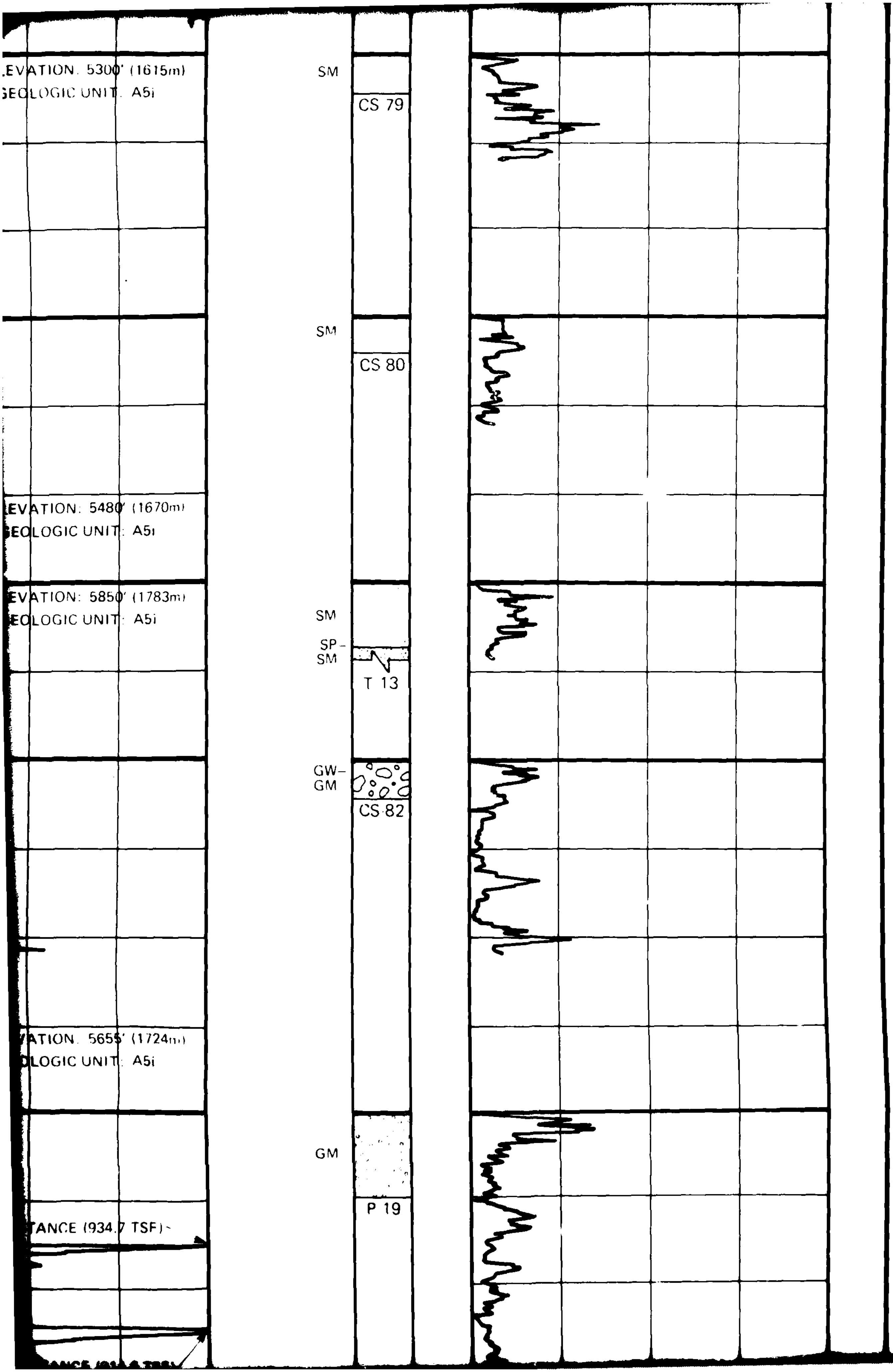
6
FRICTION RESISTANCE (14.0 TSF)


M
C-70 SURFACE ELEVATION: 5620' (1713m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-70
C-71 SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SP-SM
SP
T-1
C-72 SURFACE ELEVATION: 5380' (1640m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-72


0 — 0
1
5
2
3 — 10
0 — 0
1
5
2
3 — 10
0 — 0
1
5
0 — 0
1
5
2
3 — 10
4
15
0 — 0
1
5
2
3 — 10
4


C 79 SURFACE ELEVATION: 5300' (1615m)
SURFICIAL GEOLOGIC UNIT: A5i
C-80 SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i
C 81 SURFACE ELEVATION: 5850' (1783m)
SURFICIAL GEOLOGIC UNIT: A5i

10

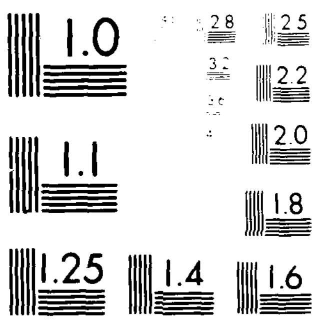


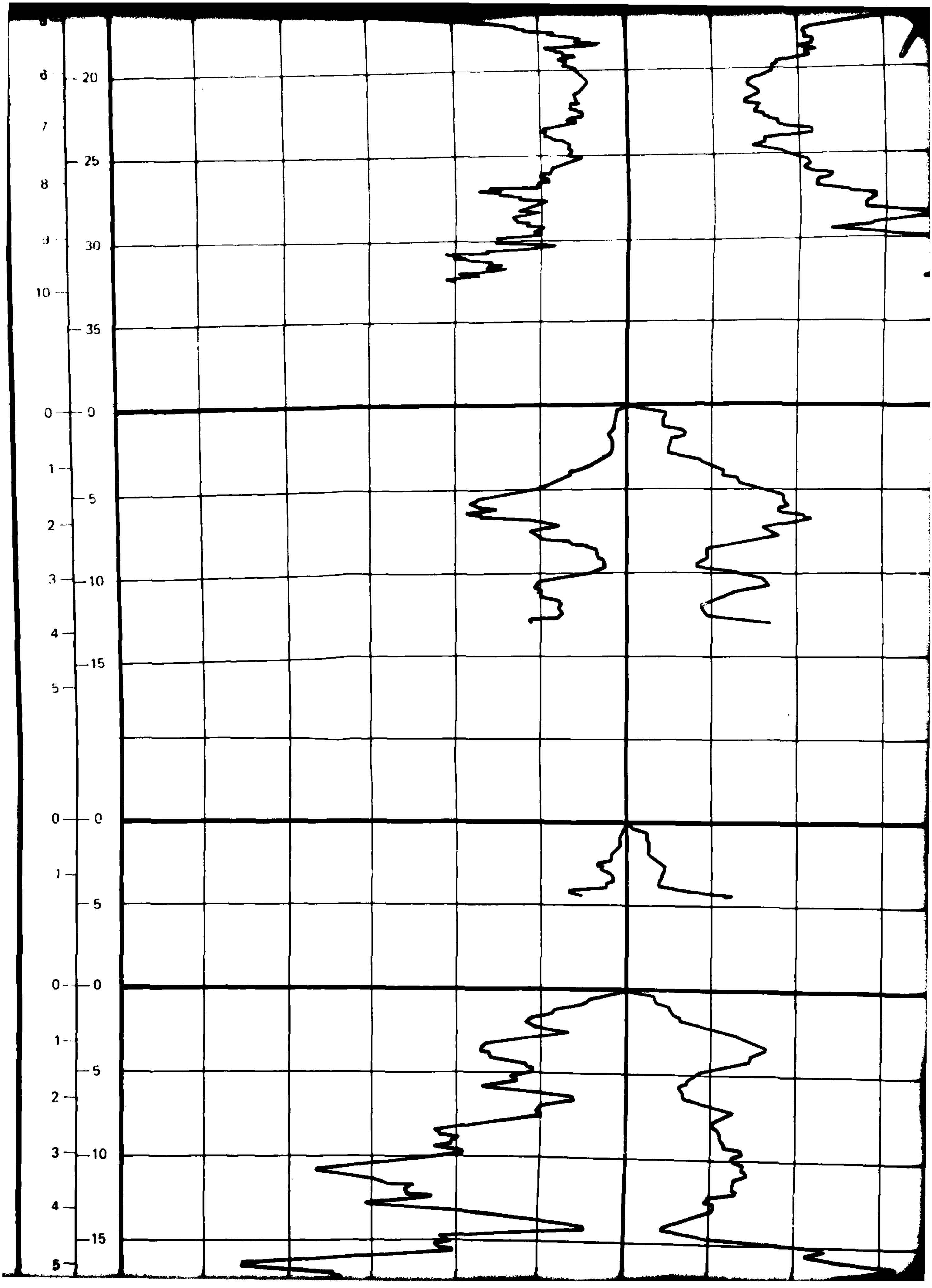
EVATION. 5300' (1615m)
GEOLOGIC UNIT. A5i
SM
CS 79
SM
CS 80
EVATION: 5480' (1670m)
GEOLOGIC UNIT: A5i
EVATION: 5850' (1783m)
EOLOGIC UNIT: A5i
SM
SP-SM
T 13
GW-GM
CS-82
VATION. 5655' (1724m)
OLOGIC UNIT: A5i
GM
P 19
TANCE (934.7 TSF)

AD-A112 849 FUGRO NATIONAL INC LONG BEACH CA F/G 8/7
MX SITING INVESTIGATION GEOTECHNICAL EVALUATION, VERIFICATION S--ETC(U)
MAR 81 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-PI-2 NL

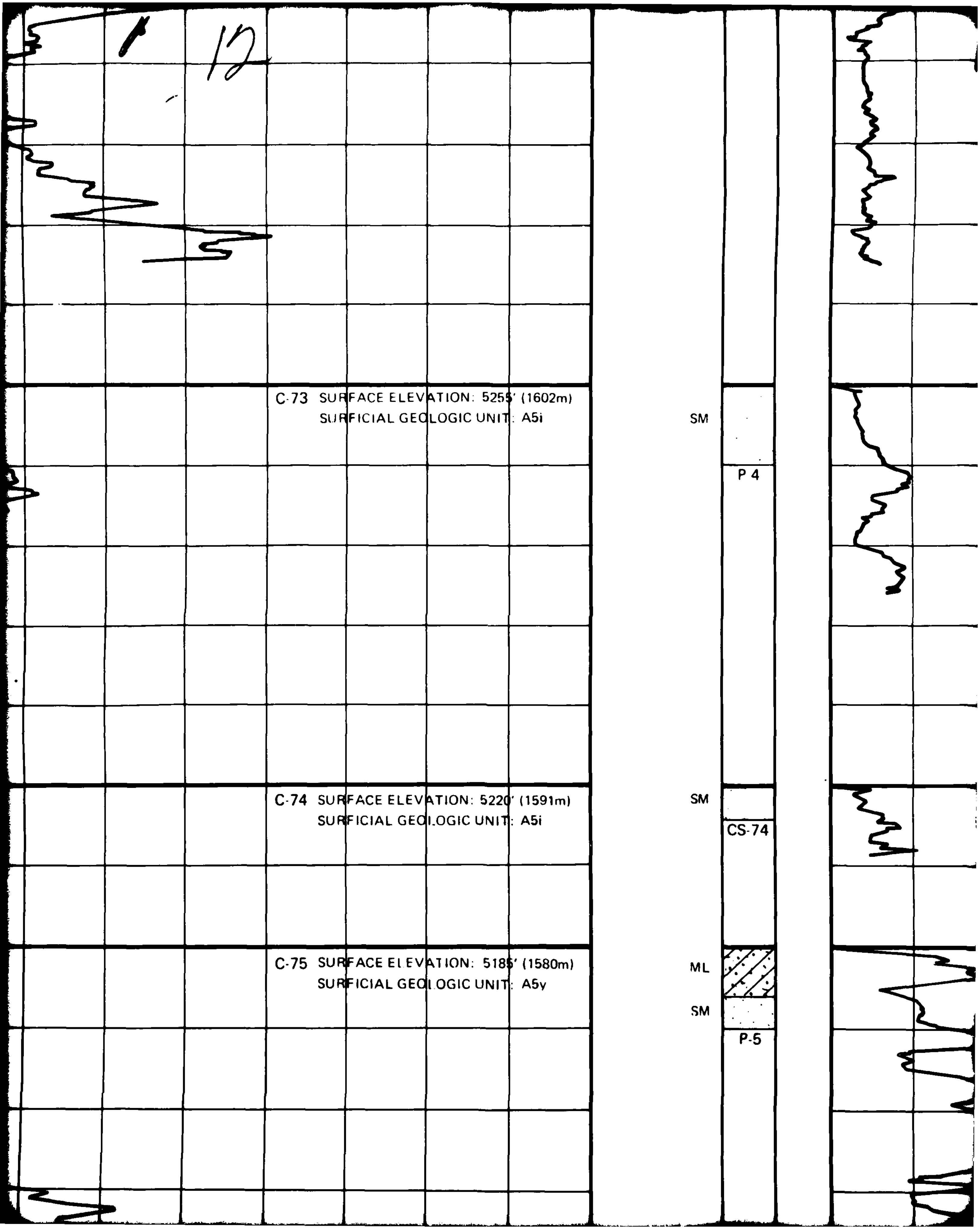
4 OF 4
AD A
112849

END
4-82

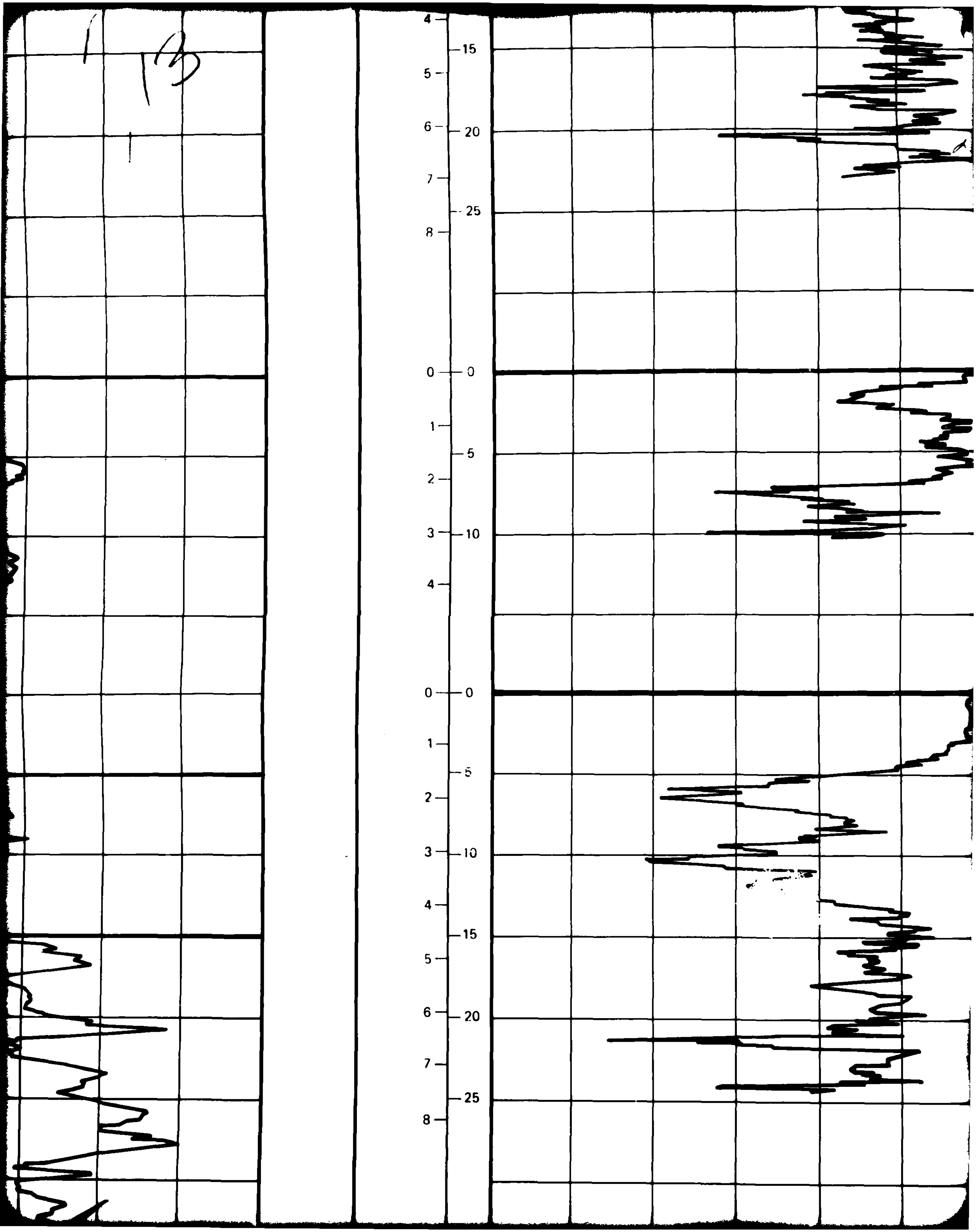

1.0
2.8
2.5
3.2
2.2
3.6
2.0
1.1
1.8
1.25
1.4
1.6



6 20
7
25
8
9 30
10
35
0 0
1
5
2
3 10
4
15
5
0 0
1
5
0 0
1
5
2
3 10
4
15
5



12
C-73 SURFACE ELEVATION: 5255' (1602m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
P 4
C-74 SURFACE ELEVATION: 5220' (1591m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
CS-74
C-75 SURFACE ELEVATION: 5185' (1580m)
SURFICIAL GEOLOGIC UNIT: A5y
ML
SM
P-5


4
15
5
6
20
7
25
8
0
0
1
5
2
3
10
4
0
0
1
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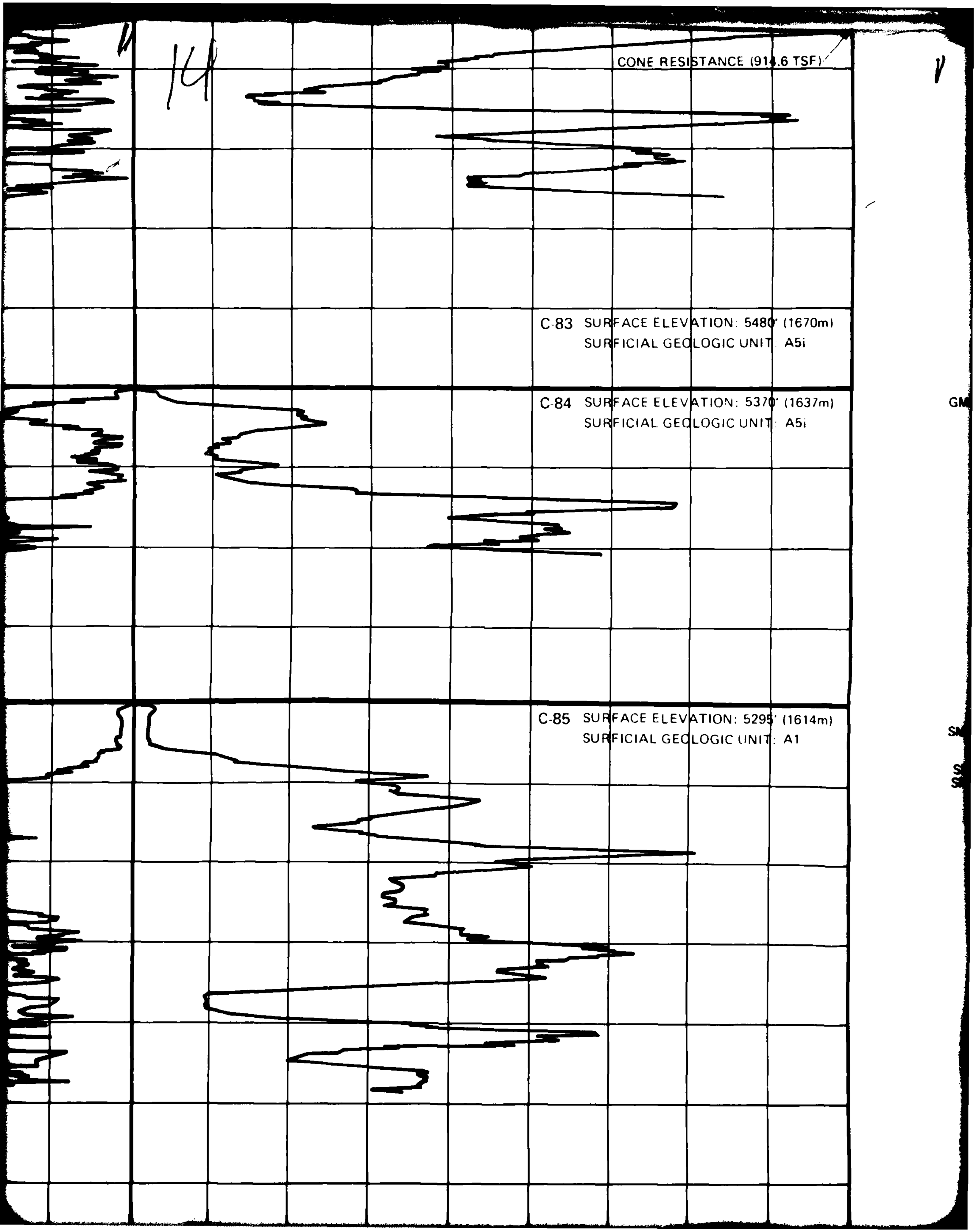
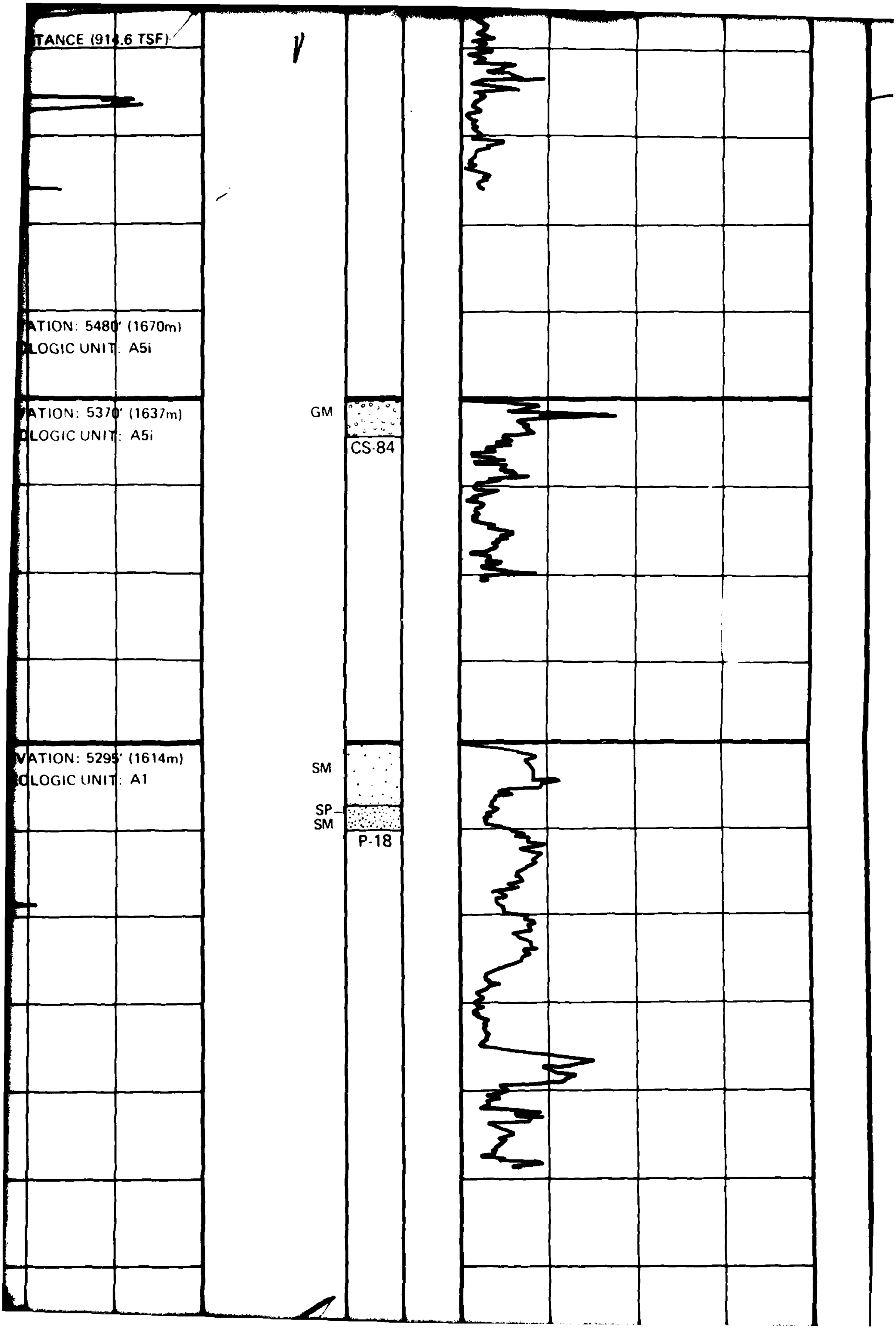
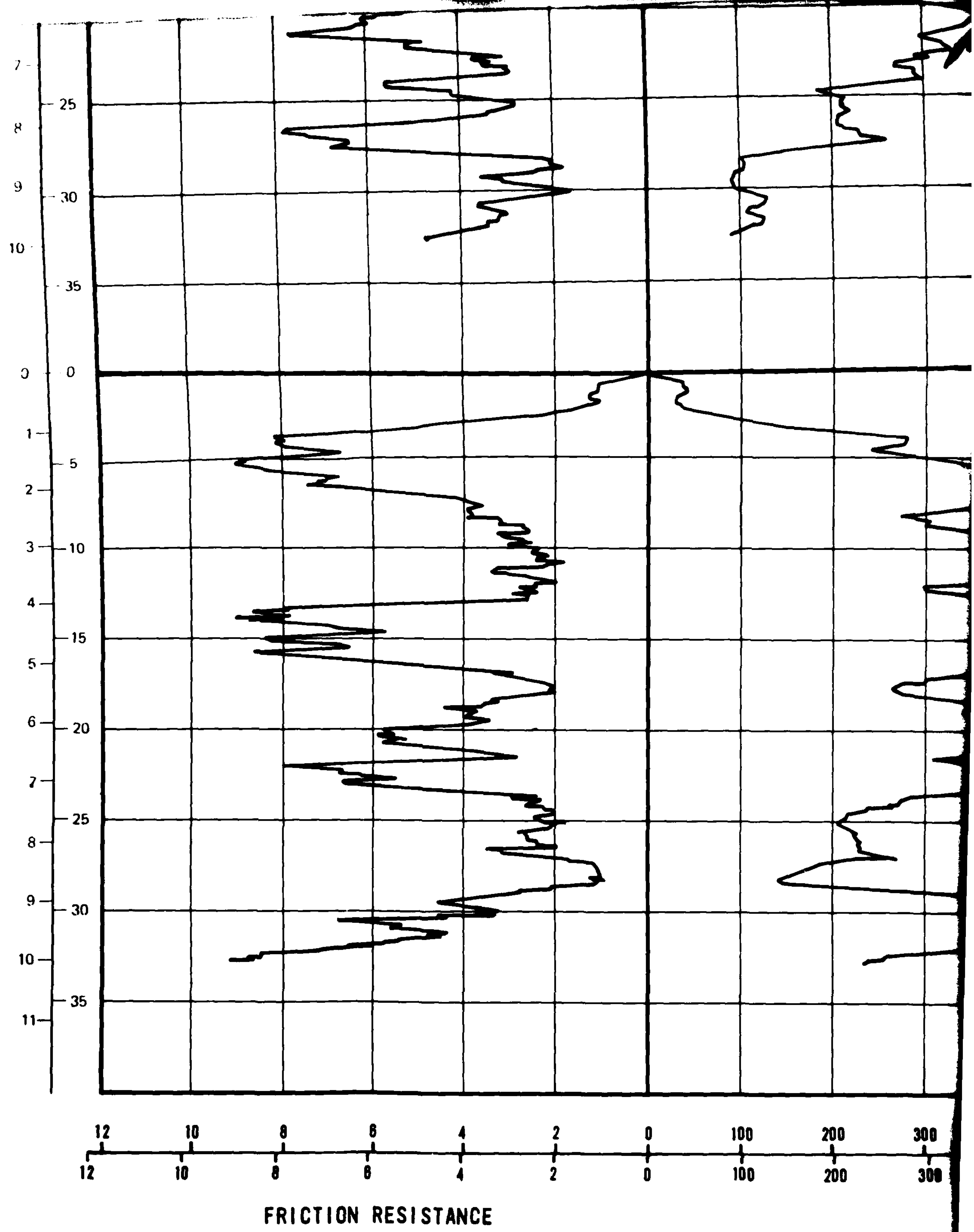
6
20
7
25
8

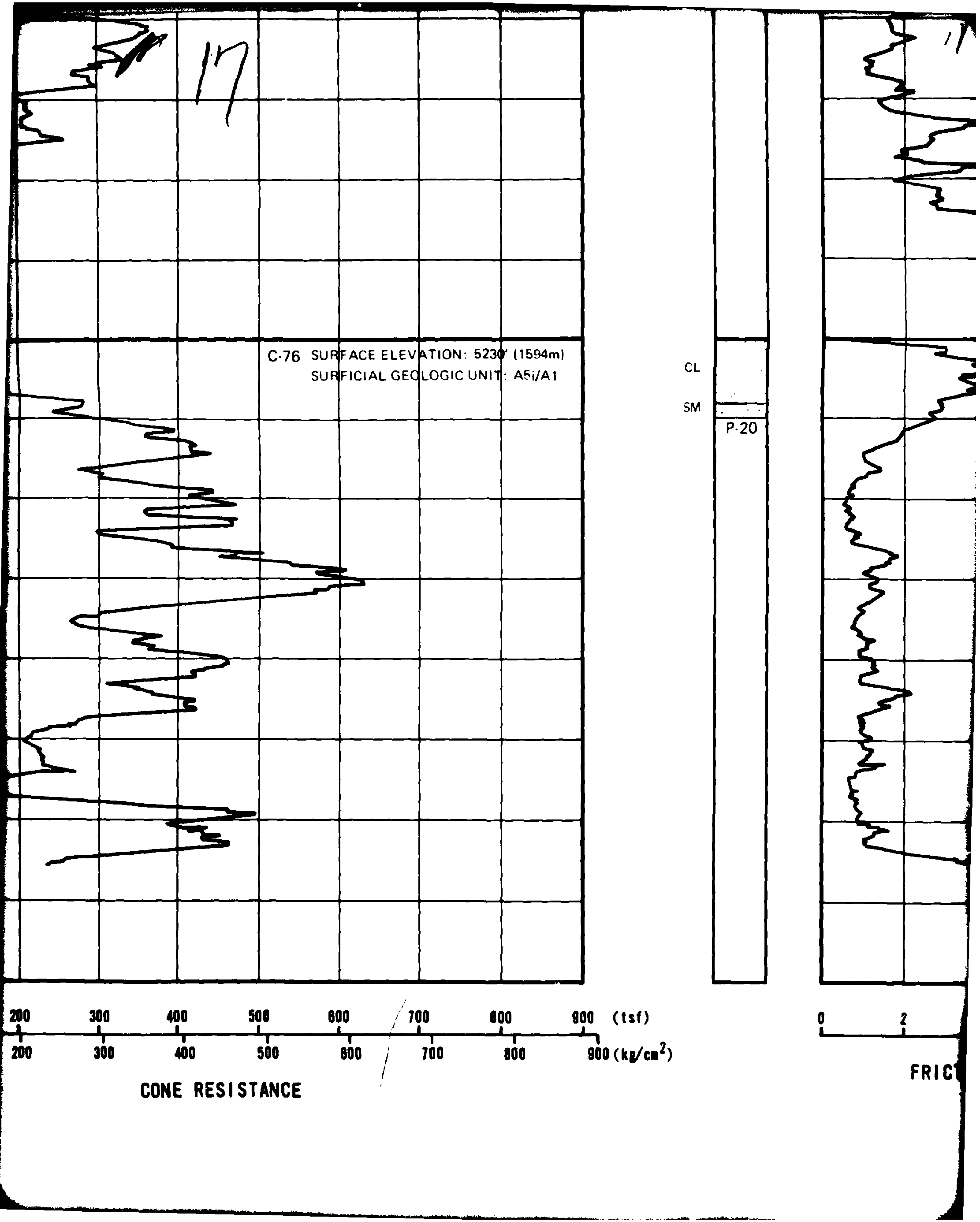

14
CONE RESISTANCE (914.6 TSF)
C-83 SURFACE ELEVATION: 5480' (1670m)
SURFICIAL GEOLOGIC UNIT: A5i
C-84 SURFACE ELEVATION: 5370' (1637m)
SURFICIAL GEOLOGIC UNIT: A5i
C-85 SURFACE ELEVATION: 5295' (1614m)
SURFICIAL GEOLOGIC UNIT: A1


TANCE (914.6 TSF)
ATION: 5480' (1670m)
LOGIC UNIT: A5i
ATION: 5370' (1637m)
LOGIC UNIT: A5i
GM
CS-84
ATION: 5295' (1614m)
LOGIC UNIT: A1
SM
SP-
SM
P-18

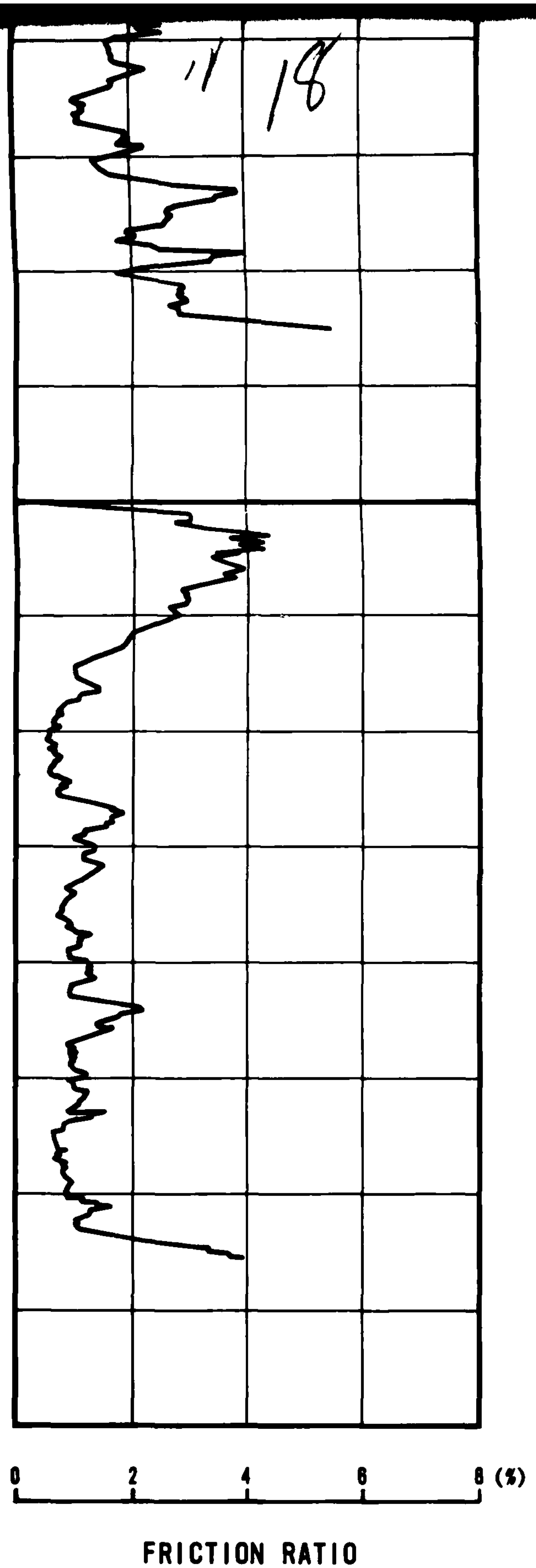
16



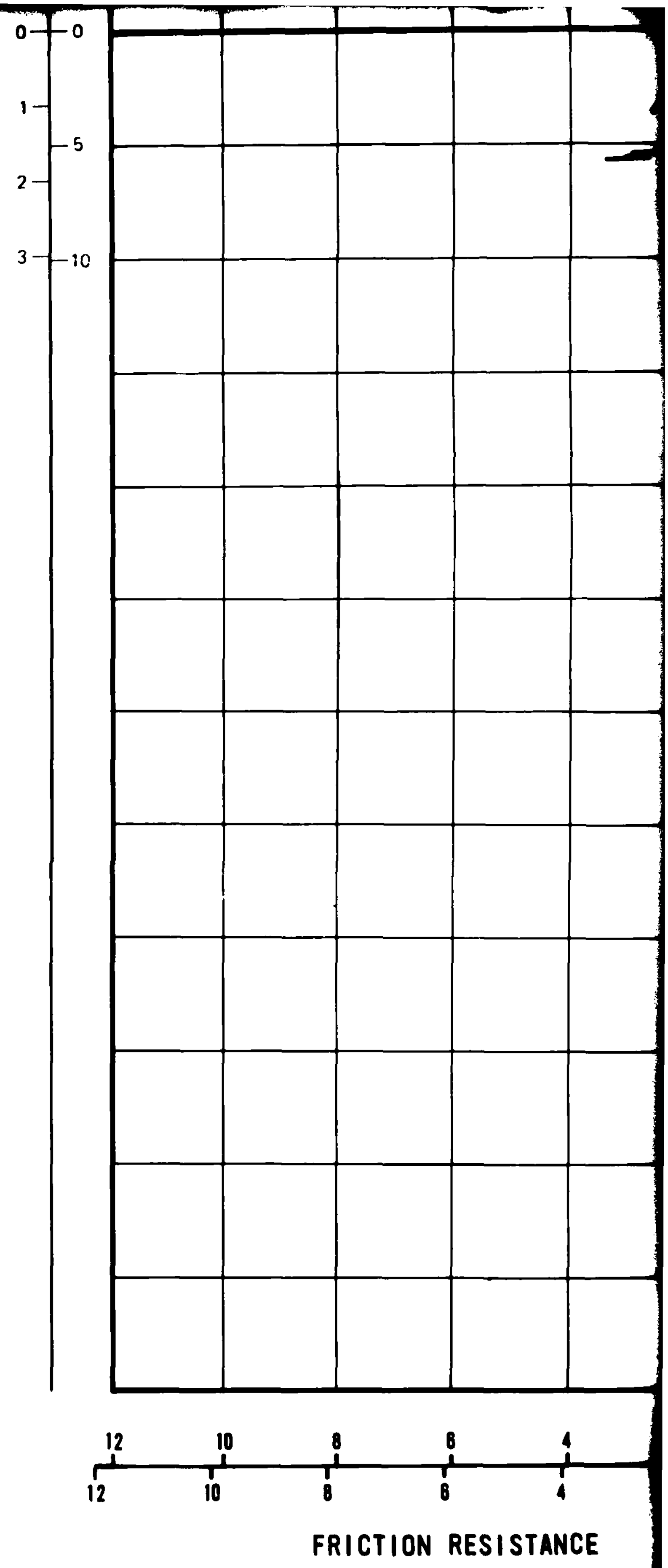
7
25
8
9
30
10
35
0
0
1
5
2
3
10
4
15
5
6
20
7
25
8
9
30
10
35
11
12 10 8 6 4 2 0 100 200 300
12 10 8 6 4 2 0 100 200 300
FRICTION RESISTANCE



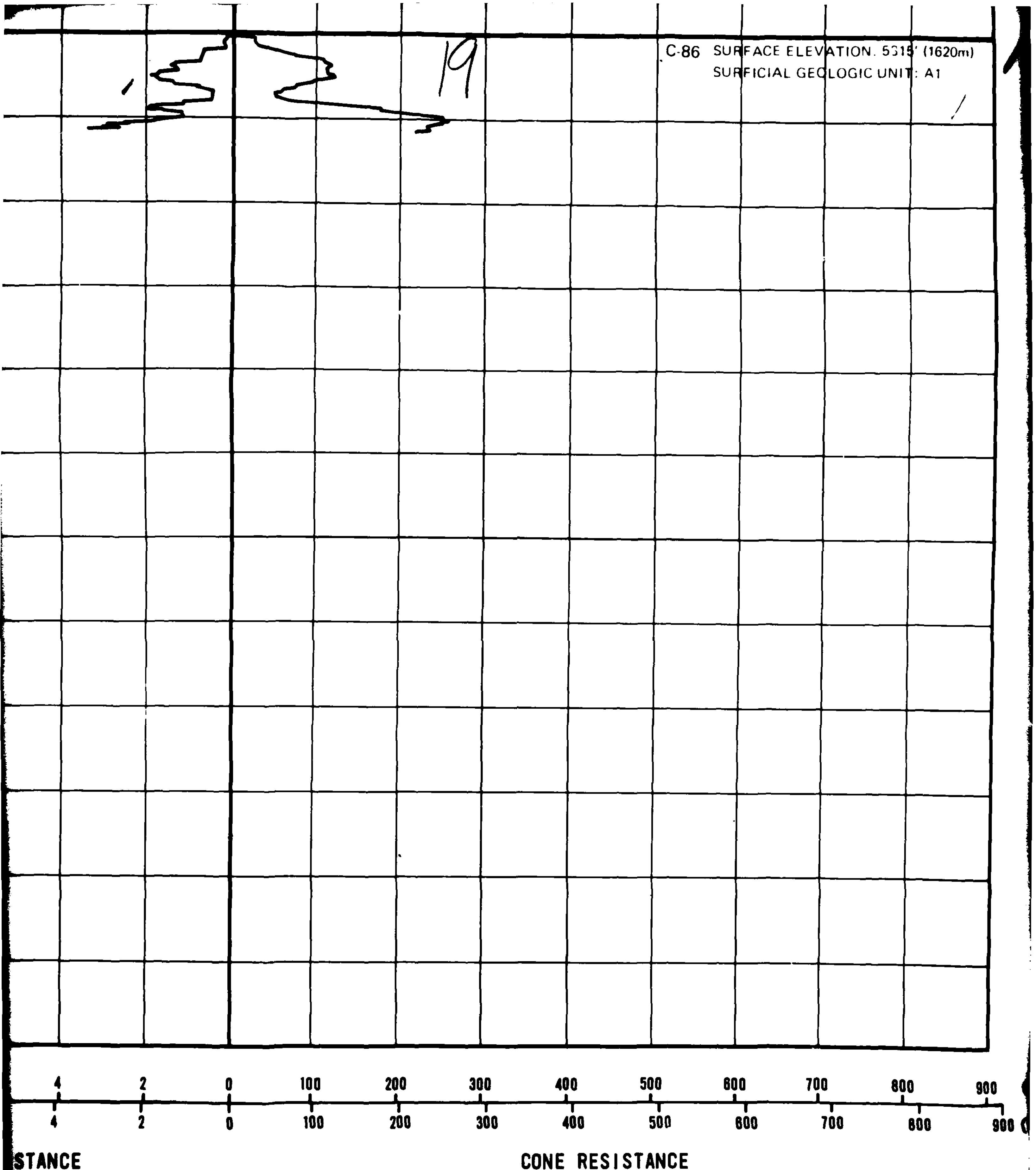
17
C-76 SURFACE ELEVATION: 5230' (1594m)
SURFICIAL GEOLOGIC UNIT: A5i/A1
CL
SM
P-20
200 300 400 500 600 700 800 900 (tsf)
200 300 400 500 600 700 800 900 (kg/cm²)
CONE RESISTANCE
0 2
FRIC

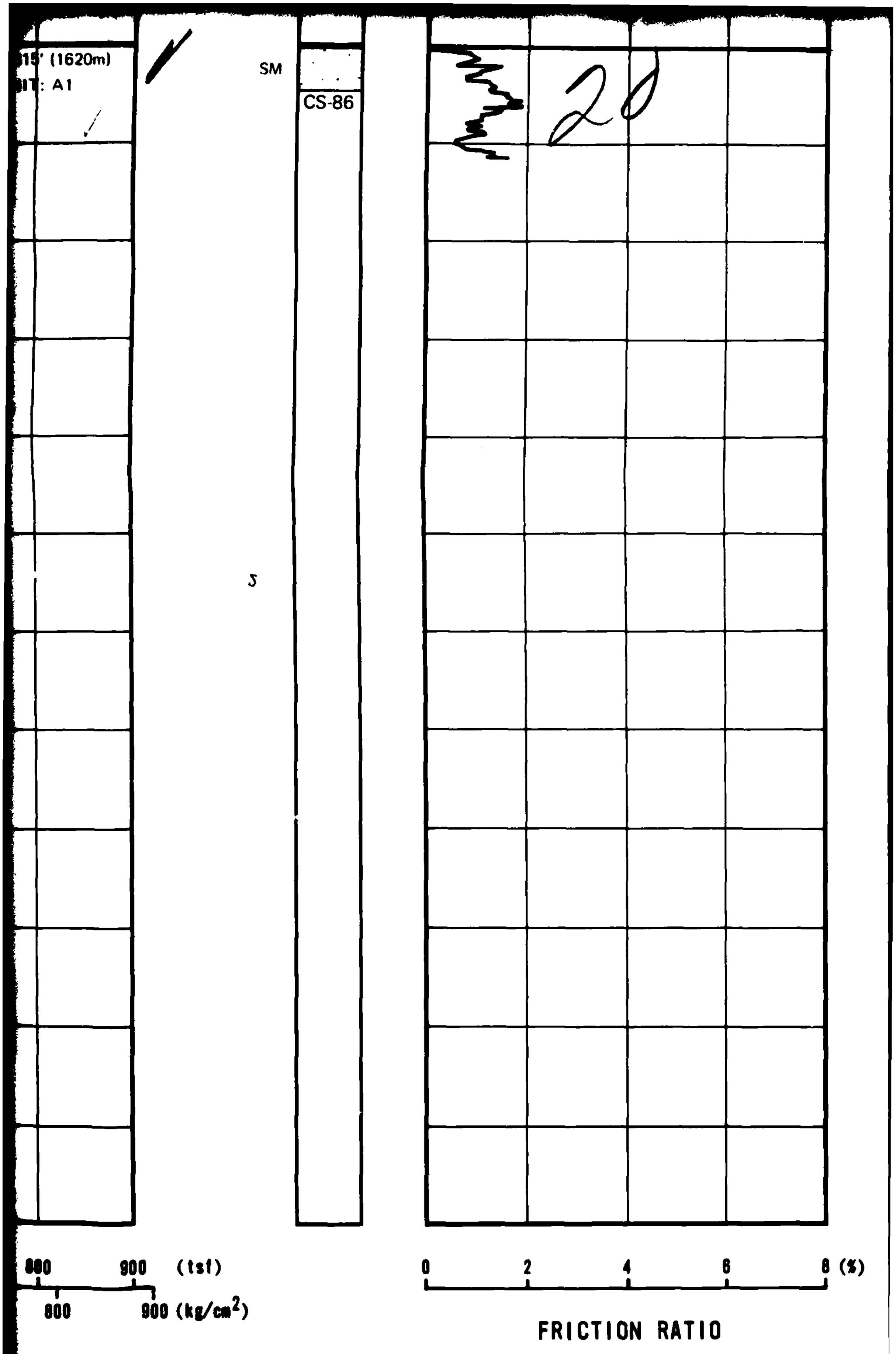


11
18
0
2
4
6
8 (%)
FRICTION RATIO

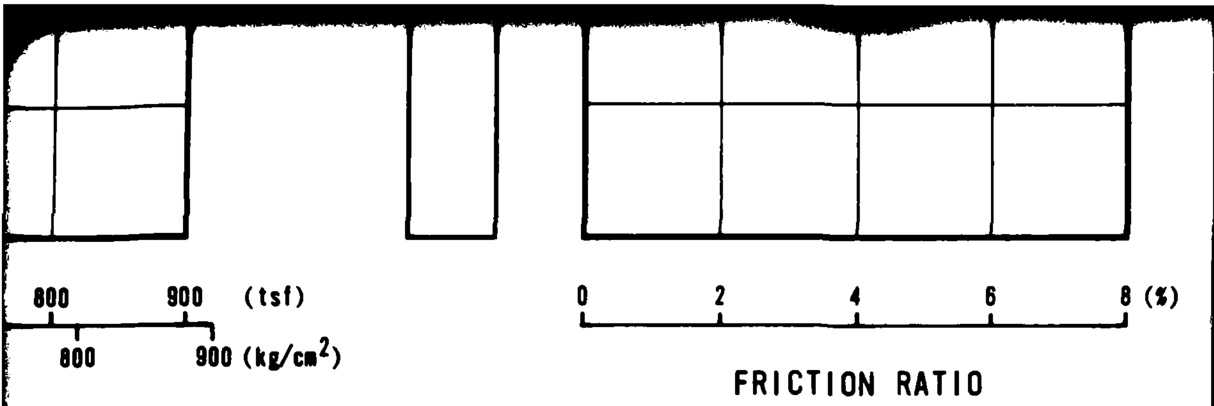


0
1
2
3
0
5
10
12
10
8
6
4
FRICTION RESISTANCE


19
C-86 SURFACE ELEVATION: 5315' (1620m)
SURFICIAL GEOLOGIC UNIT: A1
4 2 0 100 200 300 400 500 600 700 800 900
4 2 0 100 200 300 400 500 600 700 800 900
STANCE
CONE RESISTANCE



CONE PENETROMETER TEST RESULTS
PINE VALLEY, UTAH



CONE PENETROMETER TEST RESULTS
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

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II-10-1
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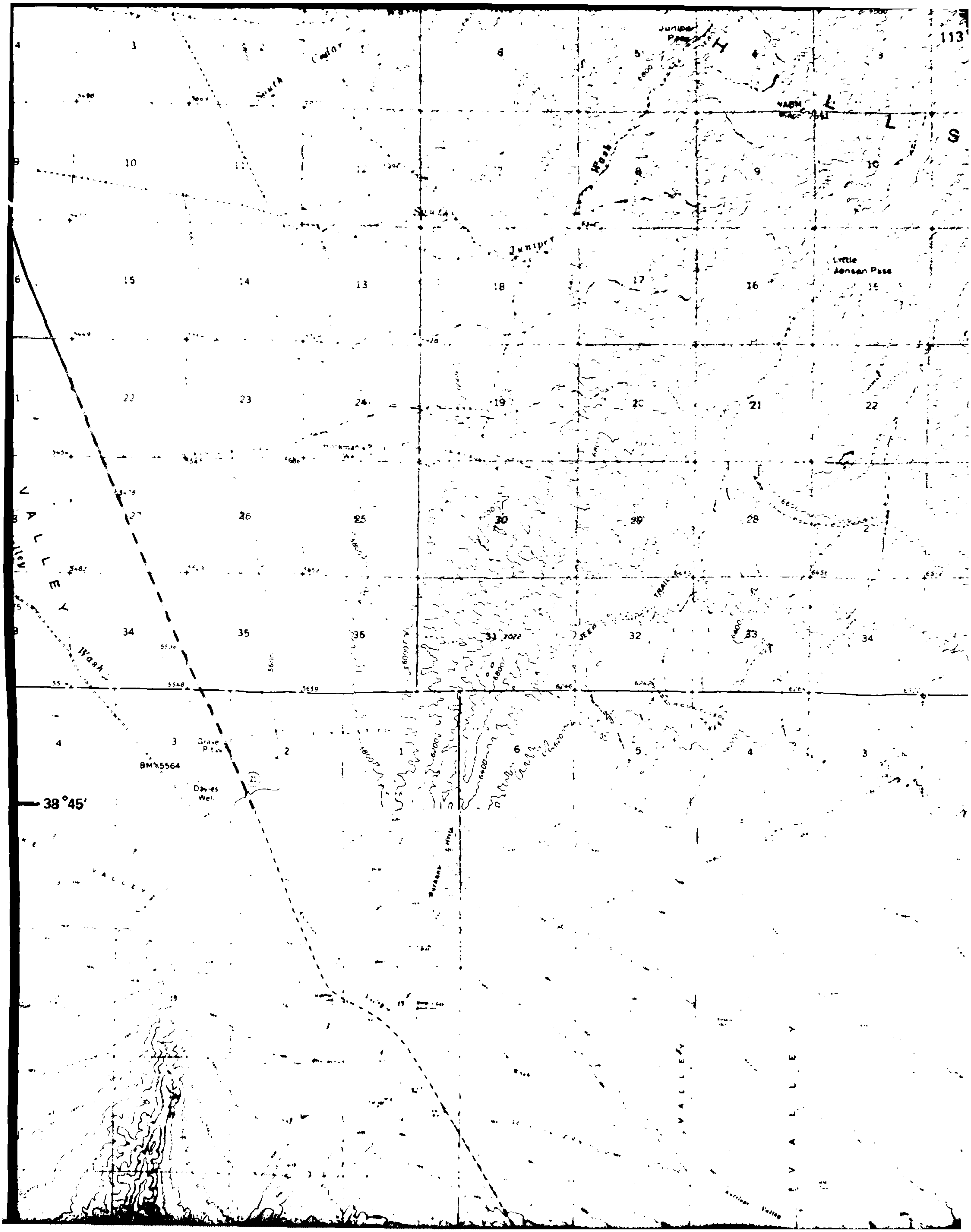
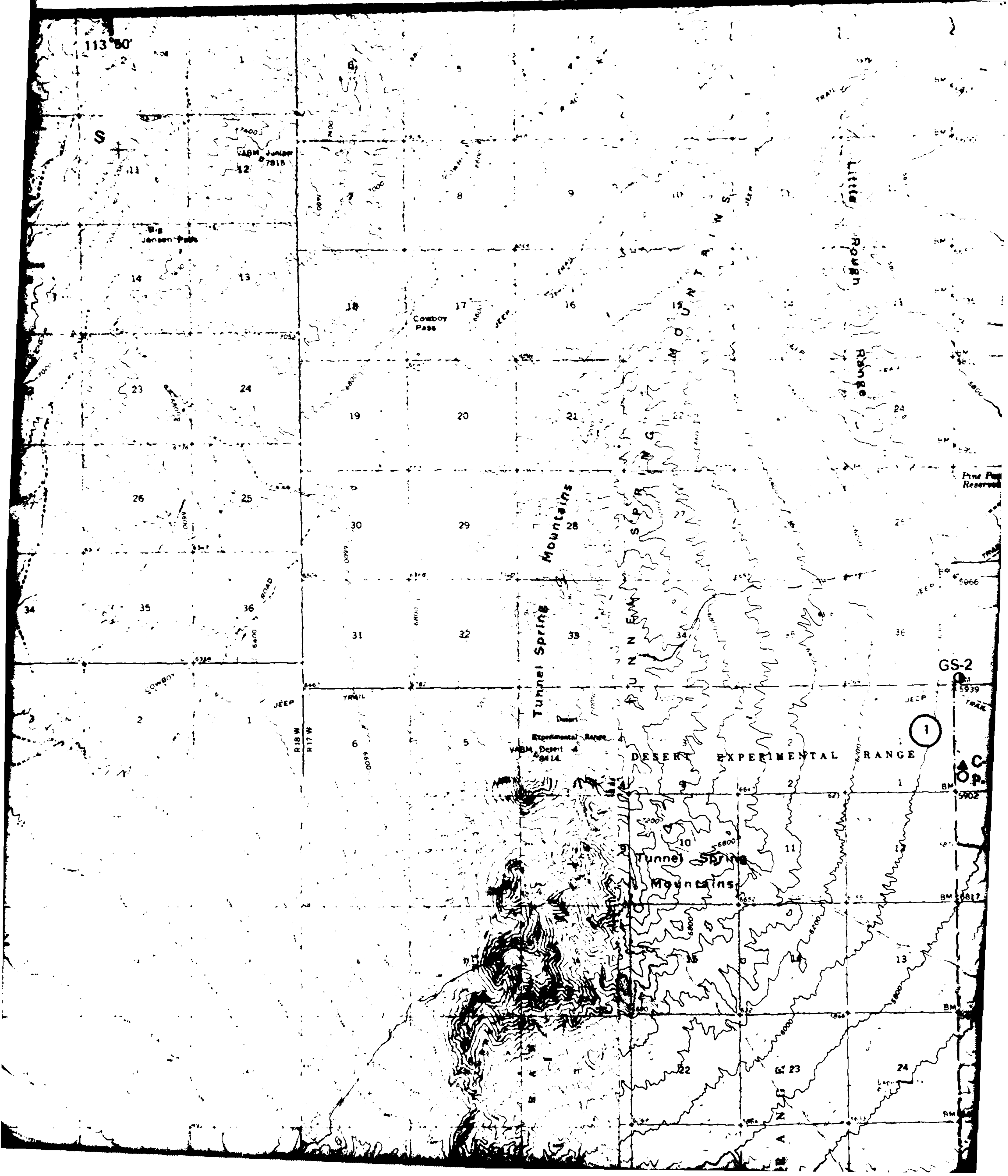
FUGRO NATIONAL, INC.

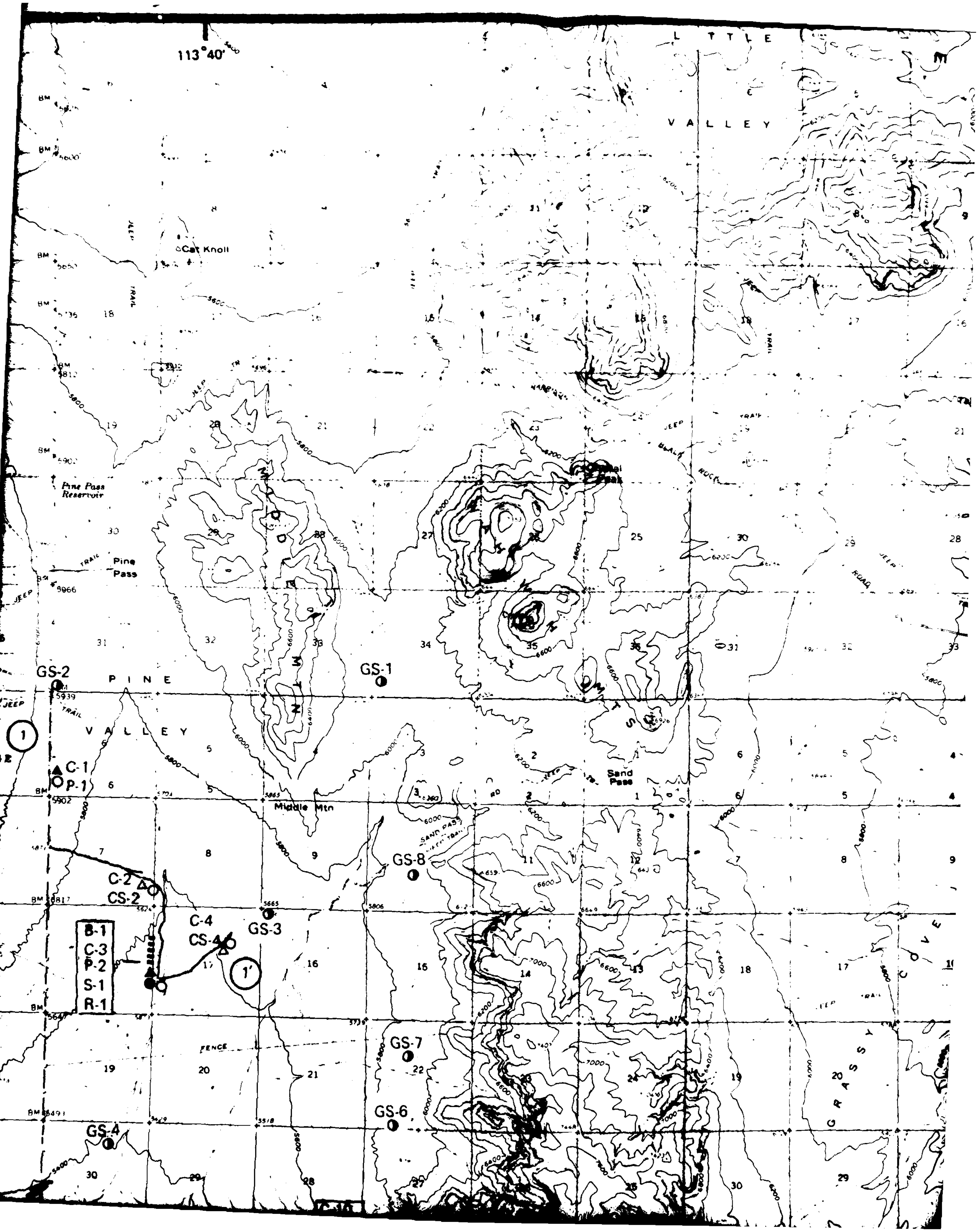
21



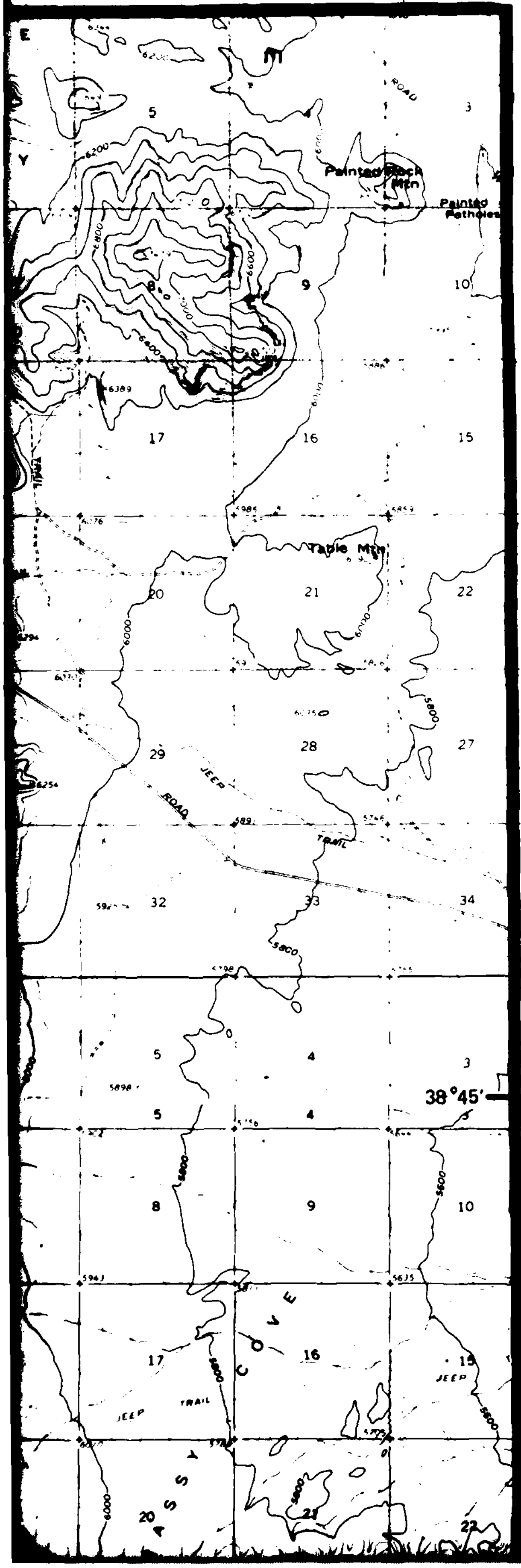
Juniper Pass
Little Jensen Pass
South
Juniper
Wash
JEEP TRAIL
VALLEY
Grave Pit
BM×5564
Davies Well
38°45'
113°

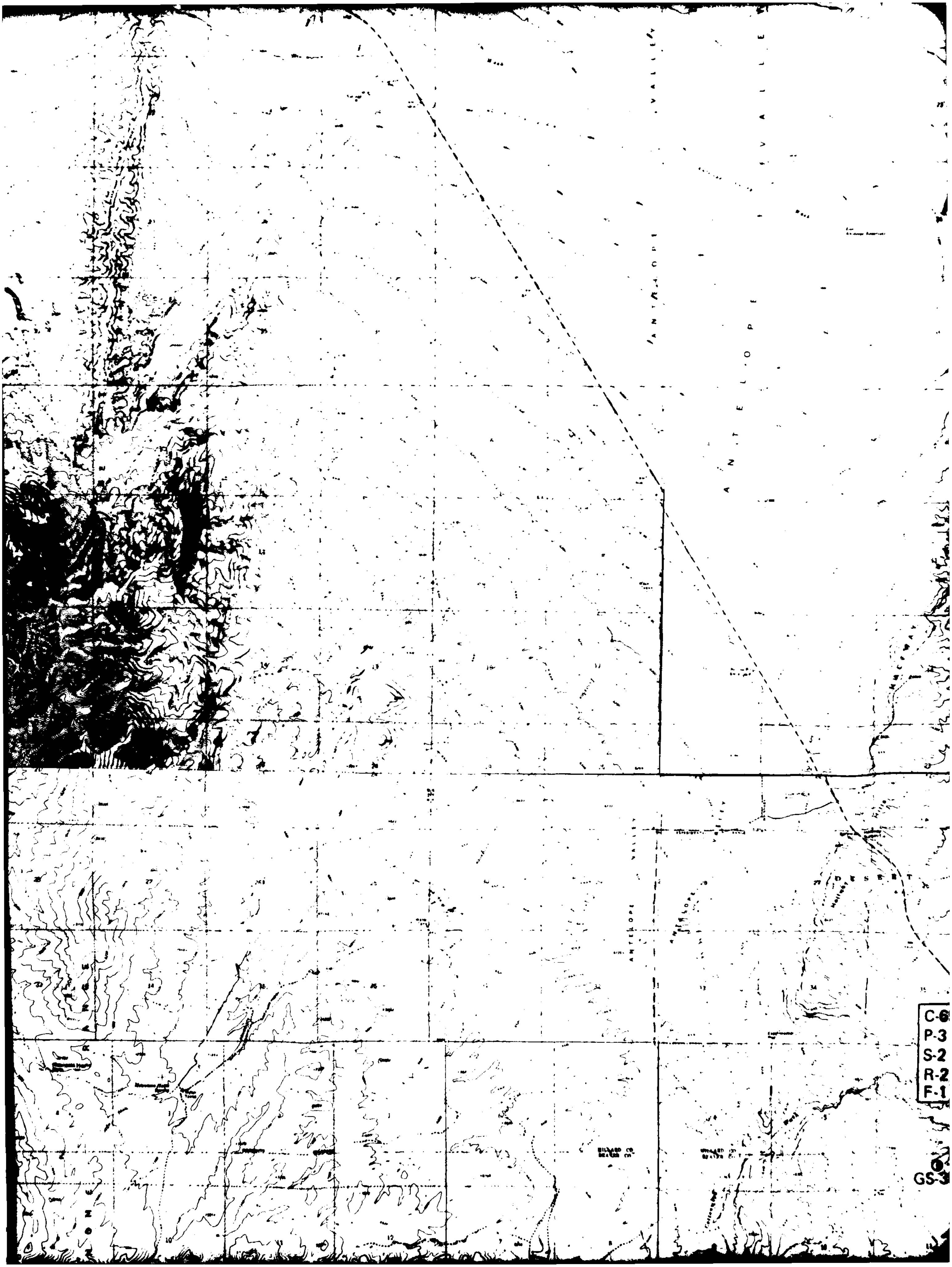


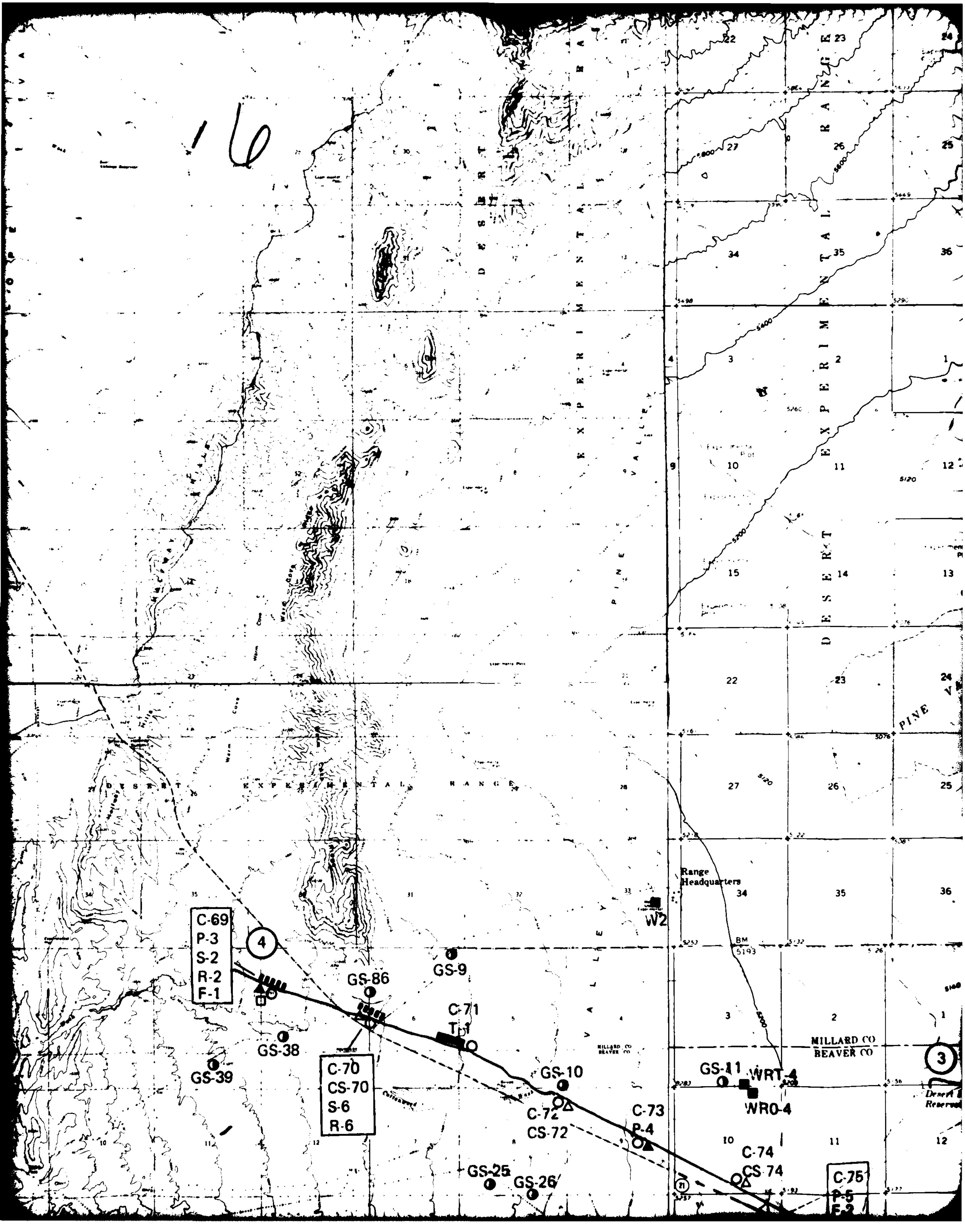
113°30'
BM Juniper 7815
Big Jensen Pass
Cowboy Pass
Little Rough Range
SPRING MOUNTAINS
Tunnel Spring Mountains
Pine Park Reservoir
GS-2
5939
5966
COWBOY
JEEP
TRAIL
ROAD
R18W
R17W
Desert Experimental Range
BM Desert 8414
DESERT EXPERIMENTAL RANGE
Tunnel Spring Mountains
5902
5817

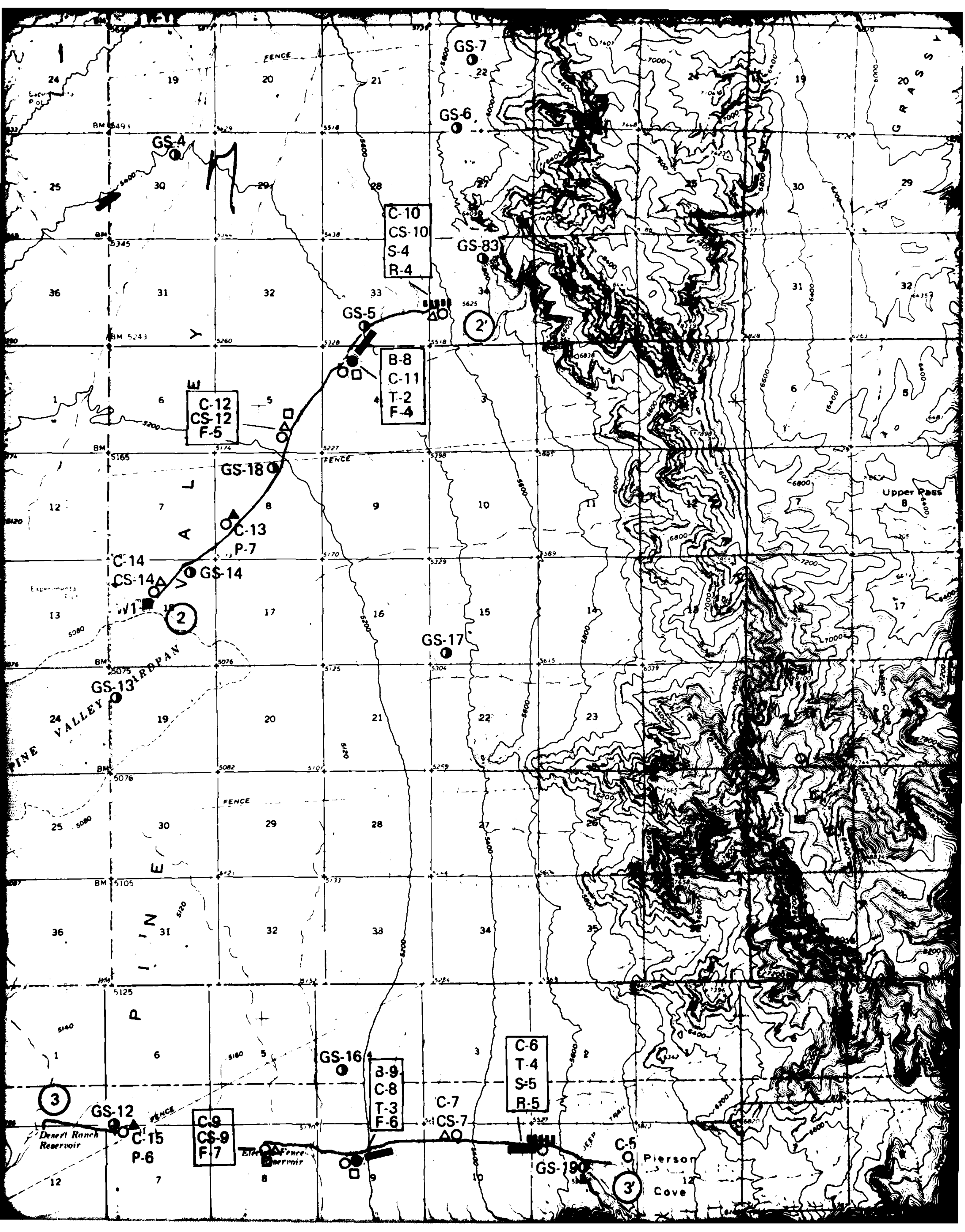

113°40'
L I T T L E
V A L L E Y
Cat Knoll
Pine Pass Reservoir
Pine Pass
P I N E
V A L L E Y
GS-2
GS-1
C-1
P-1
Middle Mtn
Sand Pass
GS-8
C-2
CS-2
C-4
CS-4
GS-3
B-1
C-3
P-2
S-1
R-1
GS-7
GS-6
GS-4
G R A S S Y
C O V E
JEEP TRAIL
JEEP ROAD
FENCE

14

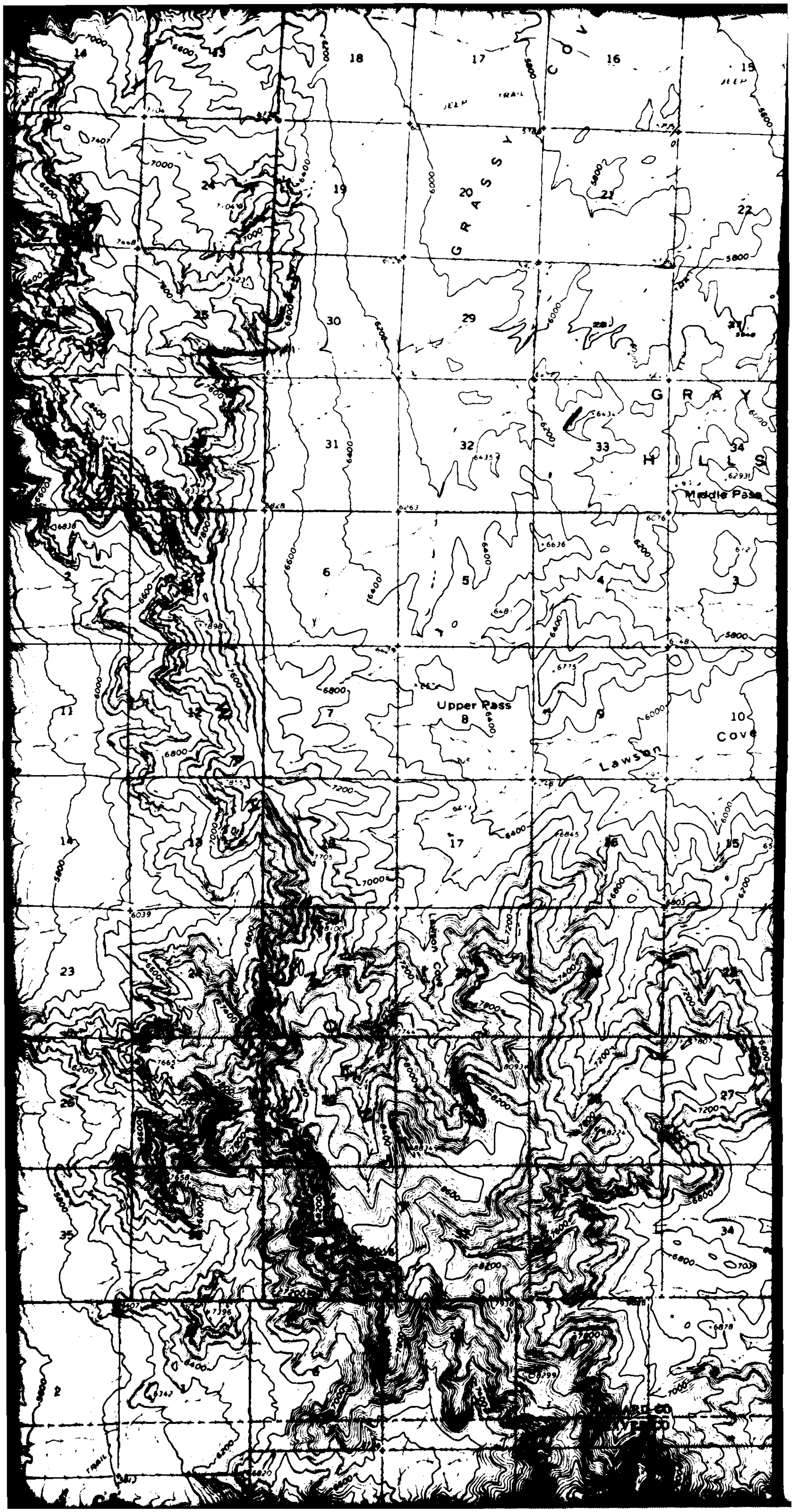

Painted Rock Mtn
Painted Potholes
ROAD
Table Mtn
JEEP ROAD
TRAIL
JEEP TRAIL
JEEP
COVE
38°45'


ANTELOPE VALLEY
ANTELOPE
DESERT
C-6
P-3
S-2
R-2
F-1
GS-3

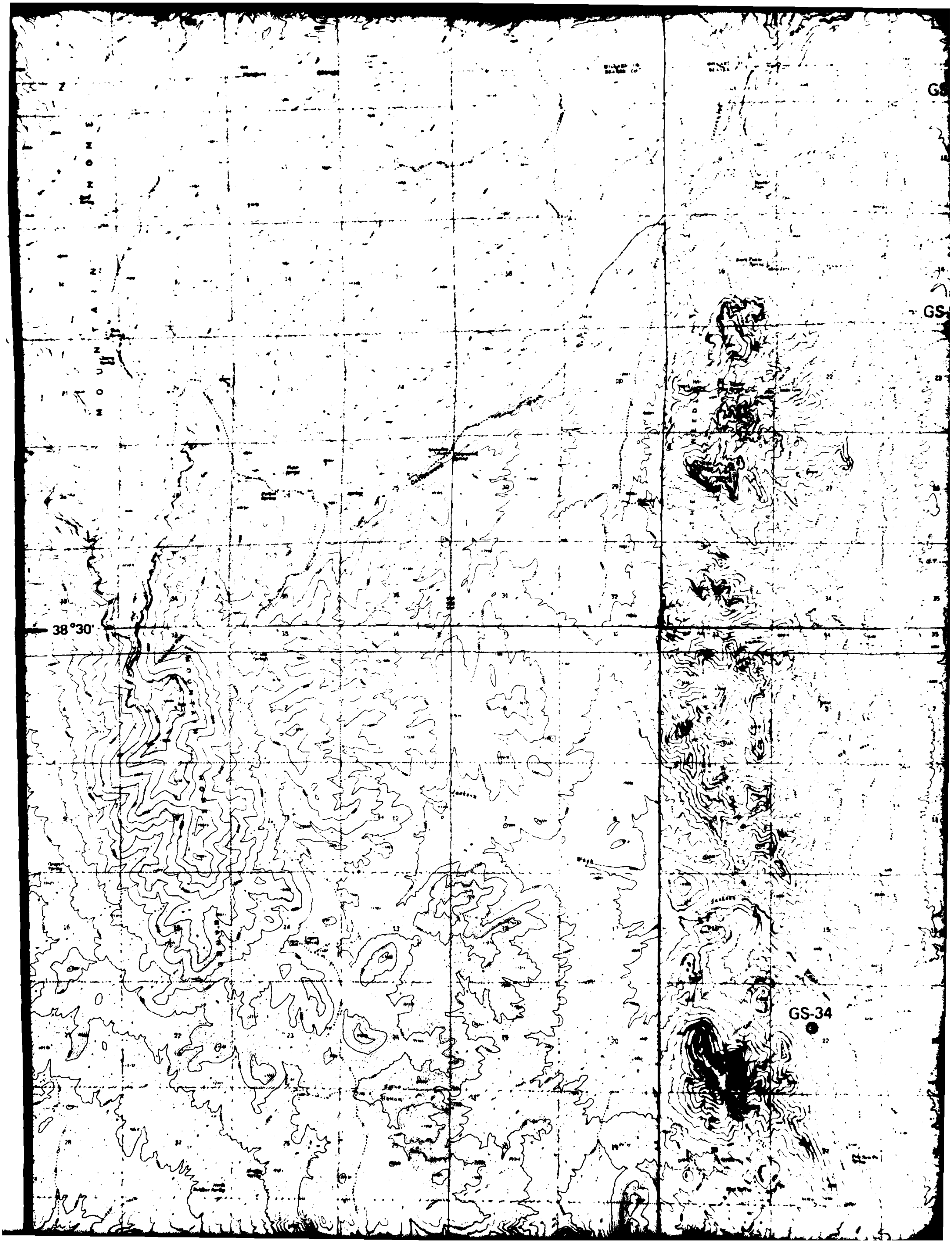

16
DESERT EXPERIMENTAL RANGE
PINE VALLEY
Range Headquarters
W2
BM 5193
MILLARD CO
BEAVER CO
C-69
P-3
S-2
R-2
F-1
C-70
CS-70
S-6
R-6
C-71
T-1
C-72
CS-72
C-73
P-4
C-74
CS-74
C-75
P-5
GS-86
GS-9
GS-38
GS-39
GS-10
GS-11
GS-25
GS-26
WRT-4
WRO-4
4
3
21



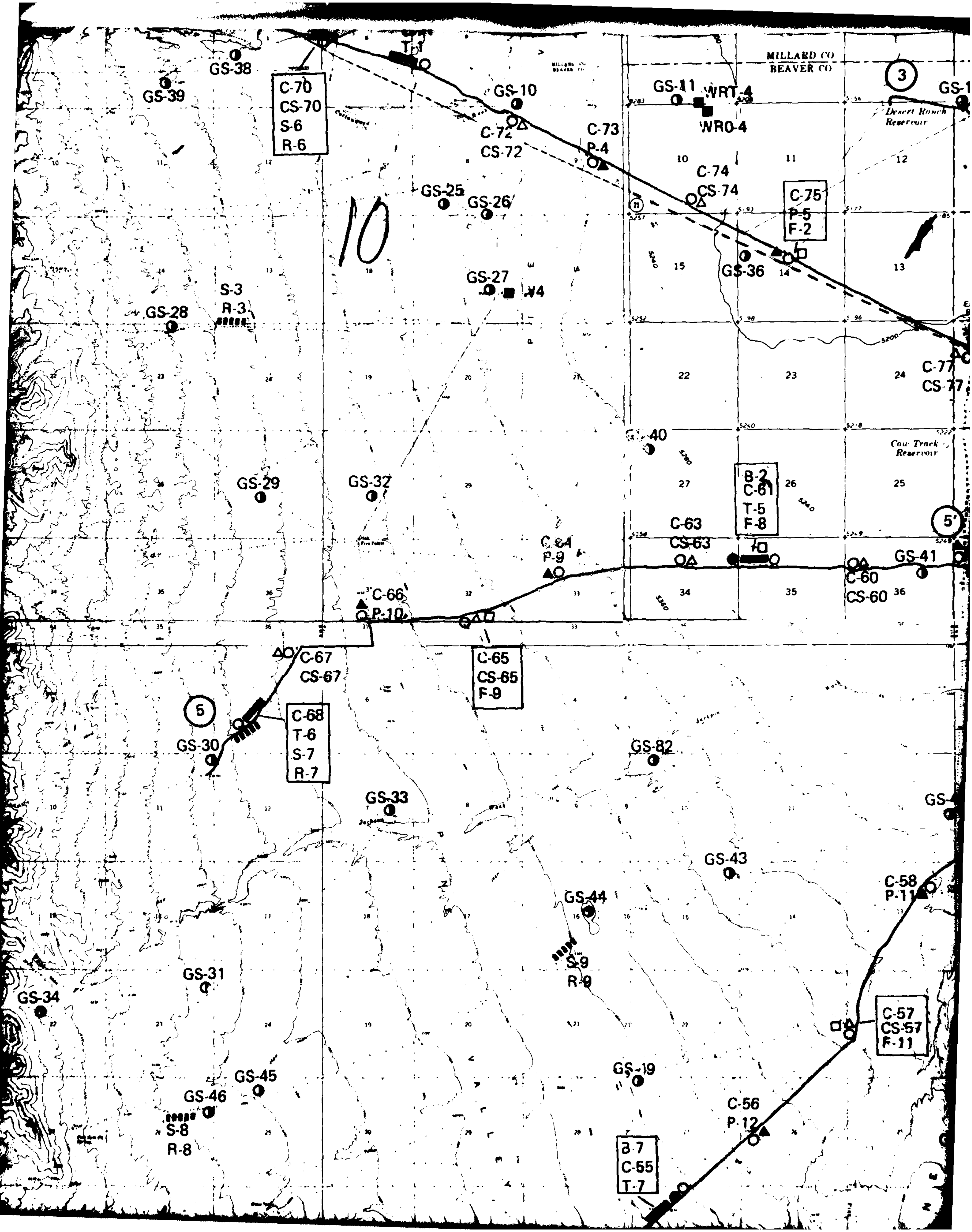
GS-7
GS-6
GS-4
GS-83
GS-5
C-10
CS-10
S-4
R-4
B-8
C-11
T-2
F-4
C-12
CS-12
F-5
GS-18
C-13
P-7
C-14
CS-14
GS-14
W1
GS-17
GS-13
PINE VALLEY
HARDPAN
Upper Pass
GS-16
B-9
C-8
T-3
F-6
C-6
T-4
S-5
R-5
C-7
CS-7
GS-12
C-15
P-6
C-9
CS-9
F-7
Desert Ranch Reservoir
GS-19
C-5
Pierson Cove
FENCE
JEEP TRAIL



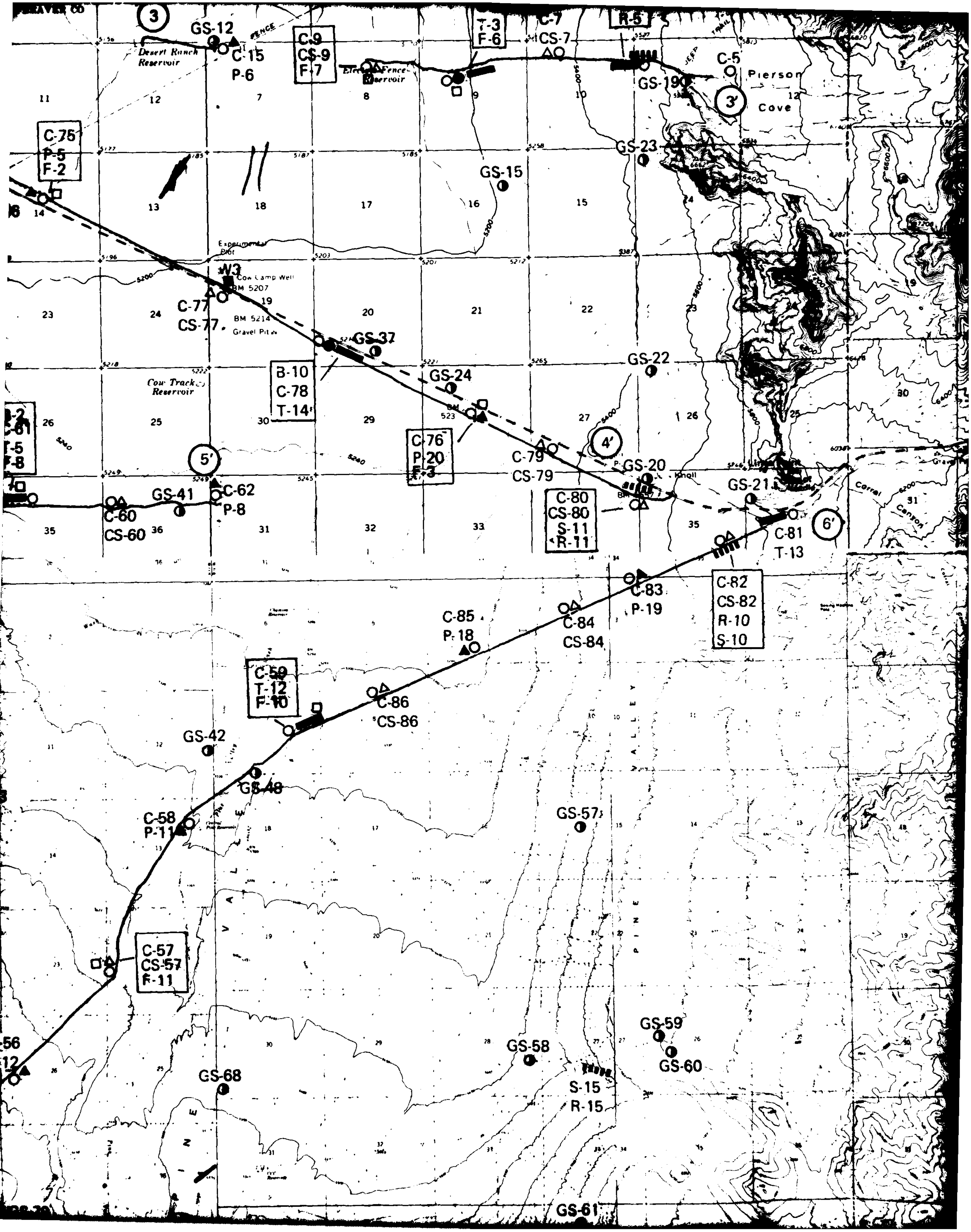
GRASSY COVE
JEEP TRAIL
GRAY HILLS
Middle Pass
Upper Pass
Lawson Cove
TRAIL



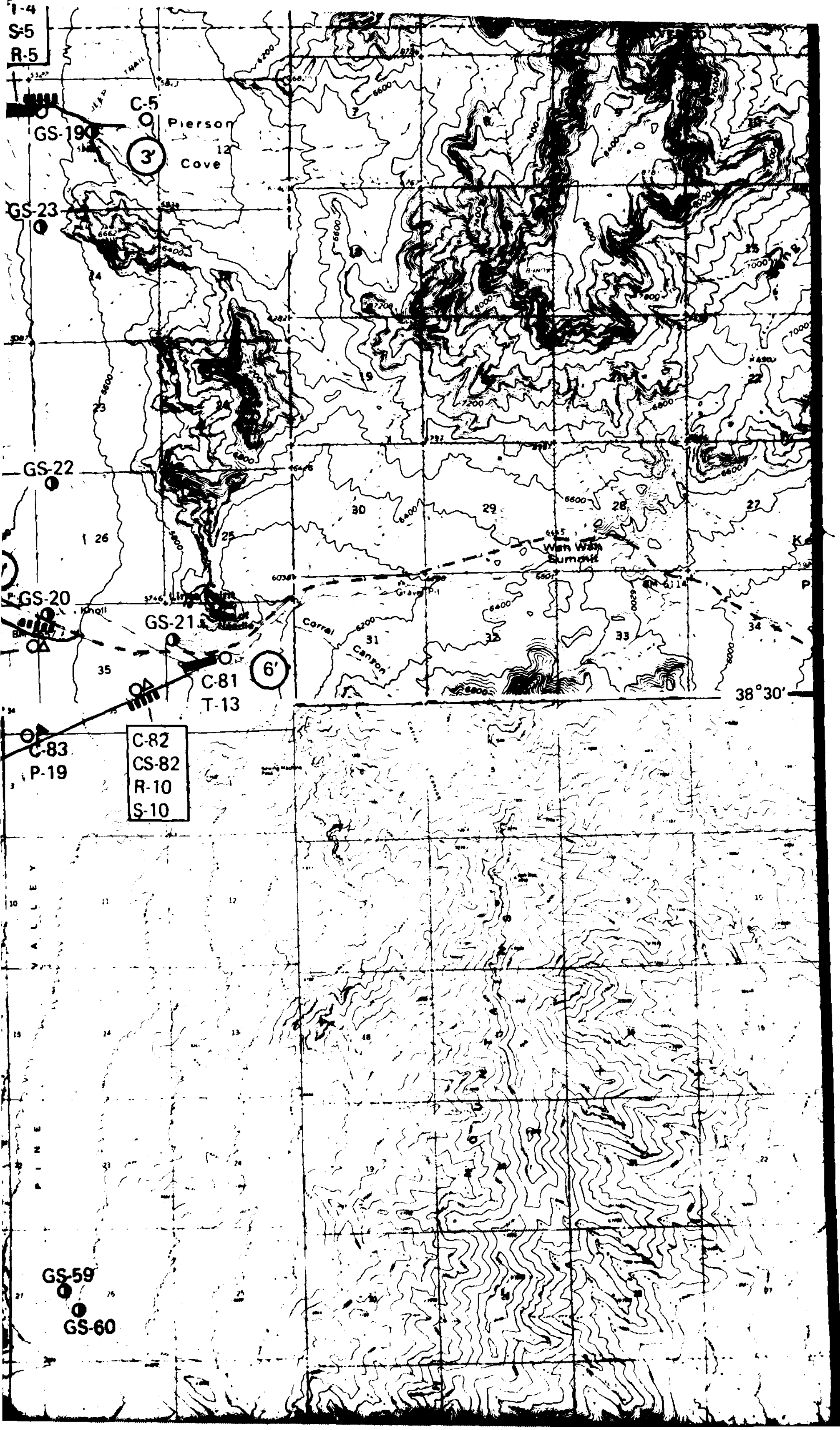
38°30'
GS-34



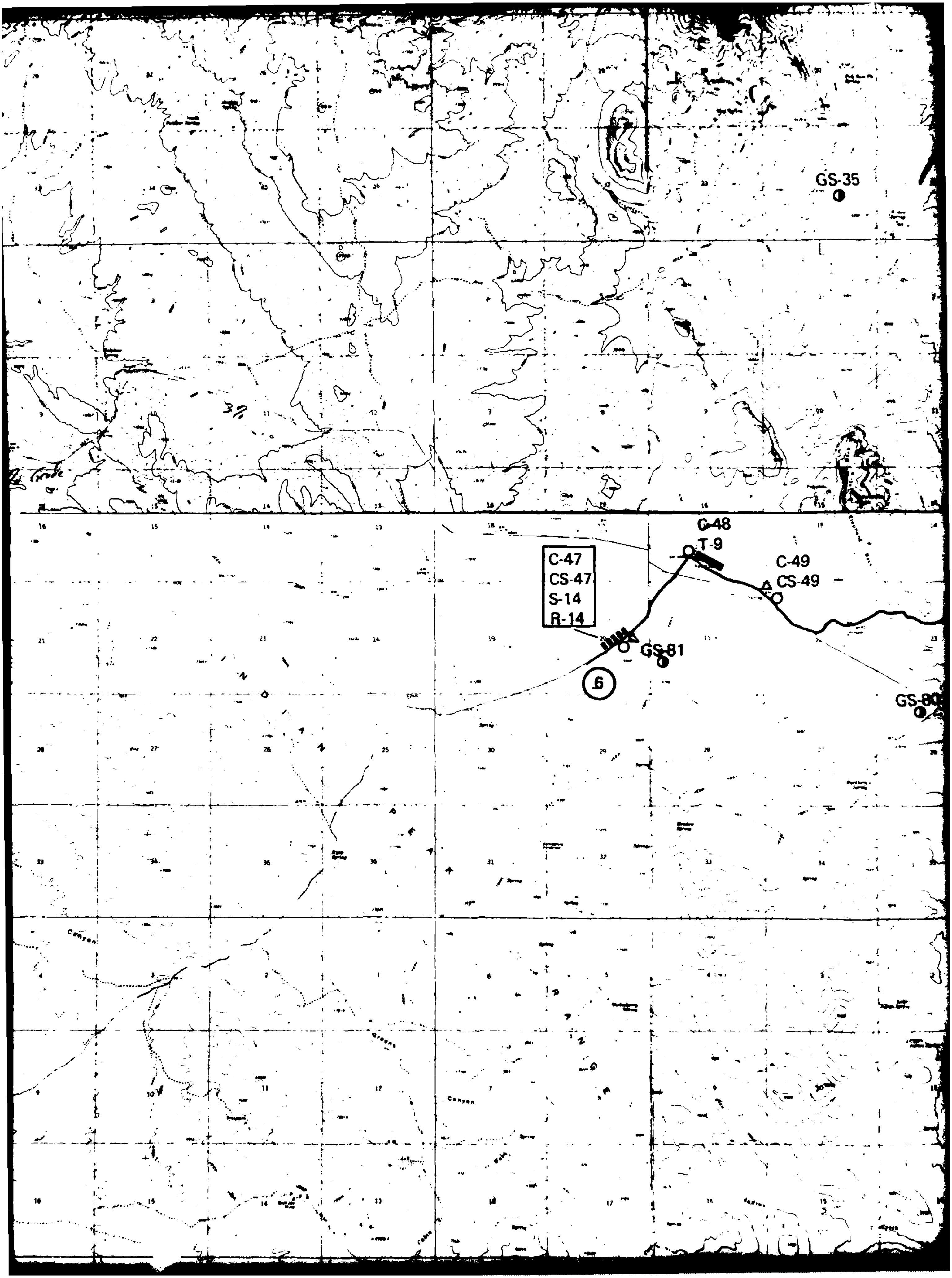
GS-38
GS-39
T-1
C-70
CS-70
S-6
R-6
GS-10
C-72
CS-72
C-73
P-4
GS-11
WRT-4
WRO-4
MILLARD CO
BEAVER CO
3
Desert Ranch Reservoir
C-74
CS-74
C-75
P-5
F-2
GS-25
GS-26
10
GS-36
GS-27
S-3
R-3
GS-28
C-77
CS-77
GS-40
Cow Track Reservoir
GS-29
GS-32
B-2
C-61
T-5
F-8
C-63
CS-63
C-64
P-9
5'
GS-41
C-60
CS-60
C-66
P-10
C-67
CS-67
C-65
CS-65
F-9
5
C-68
T-6
S-7
R-7
GS-30
GS-82
GS-33
GS-43
C-58
P-11
GS-44
S-9
R-9
GS-31
GS-34
C-57
CS-57
F-11
GS-19
GS-45
GS-46
S-8
R-8
C-56
P-12
B-7
C-65
T-7

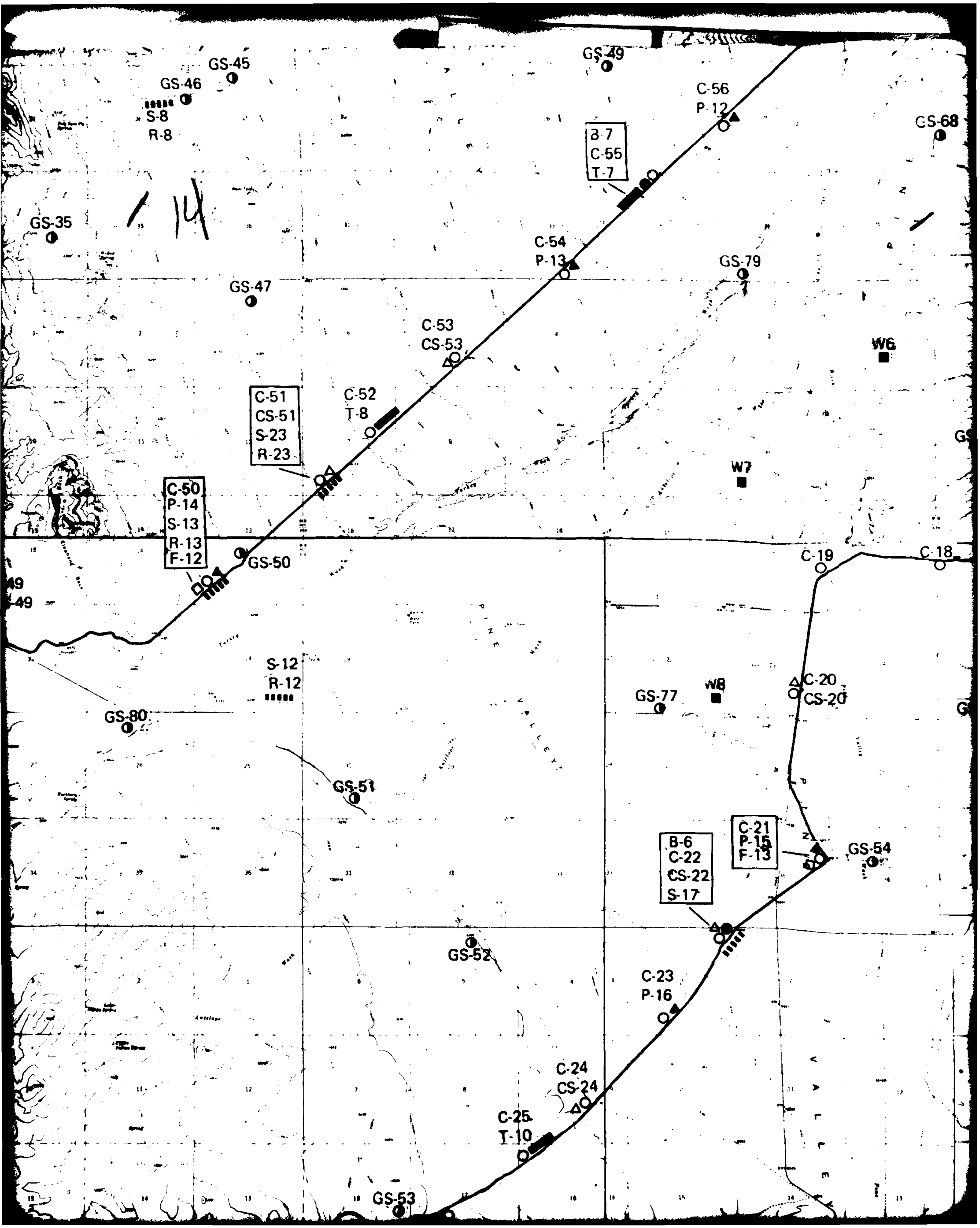


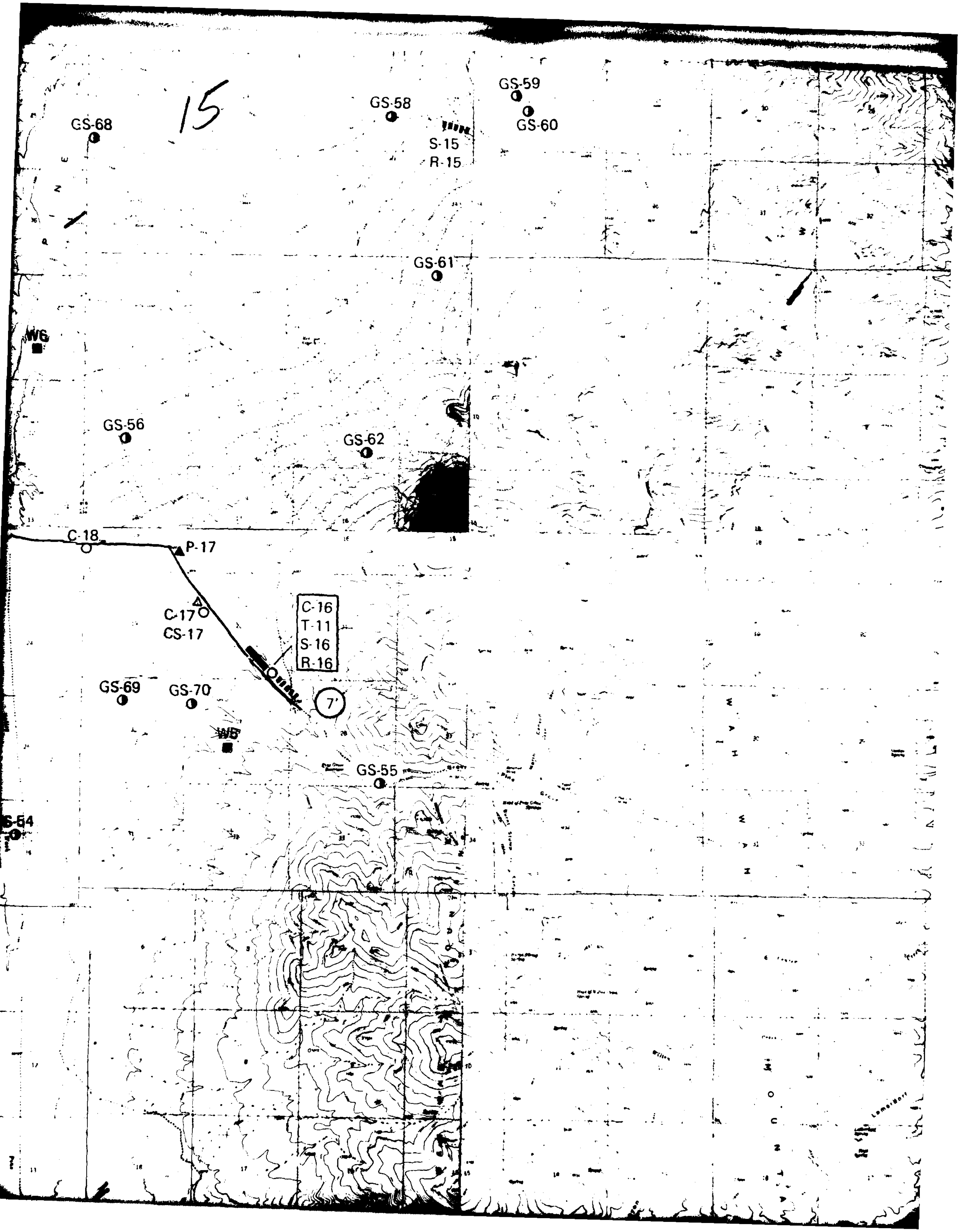
BEAVER CO
GS-12
C-15
P-6
Desert Ranch Reservoir
C-9
CS-9
F-7
T-3
F-6
C-7
CS-7
R-5
C-5
Pierson Cove
GS-19
GS-23
GS-15
C-75
P-5
F-2
Experimental Plot
W3
Cow Camp Well
BM 5207
C-77
CS-77
BM 5214
Gravel Pit
GS-37
B-10
C-78
T-14
Cow Track Reservoir
GS-24
GS-22
C-76
P-20
F-3
C-79
CS-79
GS-20
Knoll
GS-21
C-80
CS-80
S-11
R-11
C-81
T-13
Corral Canyon
C-62
P-8
GS-41
C-60
CS-60
C-82
CS-82
R-10
S-10
C-83
P-19
C-84
CS-84
C-85
P-18
C-59
T-12
F-10
C-86
CS-86
GS-42
GS-48
C-58
P-11
GS-57
C-57
CS-57
F-11
GS-59
GS-60
GS-58
GS-68
S-15
R-15
GS-61


I-4
S-5
R-5
C-5
GS-19
Pierson
Cove
3'
GS-23
GS-22
GS-20
GS-21
Knoll
Corral
Canyon
Gravel Pit
Wah Wah
Summit
6'
C-81
T-13
C-83
P-19
C-82
CS-82
R-10
S-10
38°30'
GS-59
GS-60

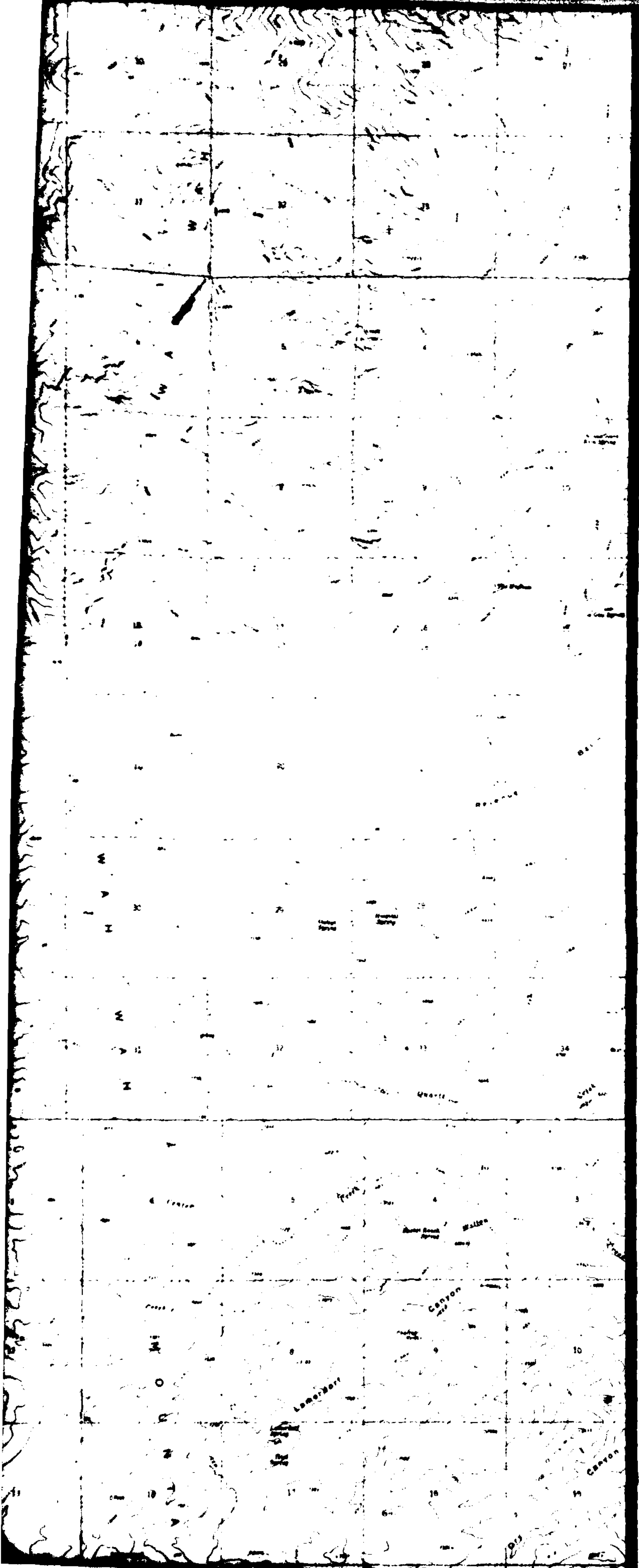
12,


GS-35
C-48
T-9
C-47
CS-47
S-14
R-14
C-49
CS-49
GS-81
6
GS-80


GS-45
GS-46
S-8
R-8
GS-49
C-56
P-12
B-7
C-55
T-7
GS-68
14
GS-35
C-54
P-13
GS-79
GS-47
C-53
CS-53
W6
C-52
T-8
C-51
CS-51
S-23
R-23
W7
C-50
P-14
S-13
R-13
F-12
GS-50
C-19
C-18
PINE
S-12
R-12
VALLEY
W8
GS-77
C-20
CS-20
GS-80
GS-51
C-21
P-15
F-13
GS-54
B-6
C-22
CS-22
S-17
GS-52
C-23
P-16
C-24
CS-24
C-25
T-10
GS-53



15
GS-68
GS-58
GS-59
GS-60
S-15
R-15
GS-61
W6
GS-56
GS-62
C-18
P-17
C-17
CS-17
C-16
T-11
S-16
R-16
GS-69
GS-70
7'
W5
GS-55
S-54



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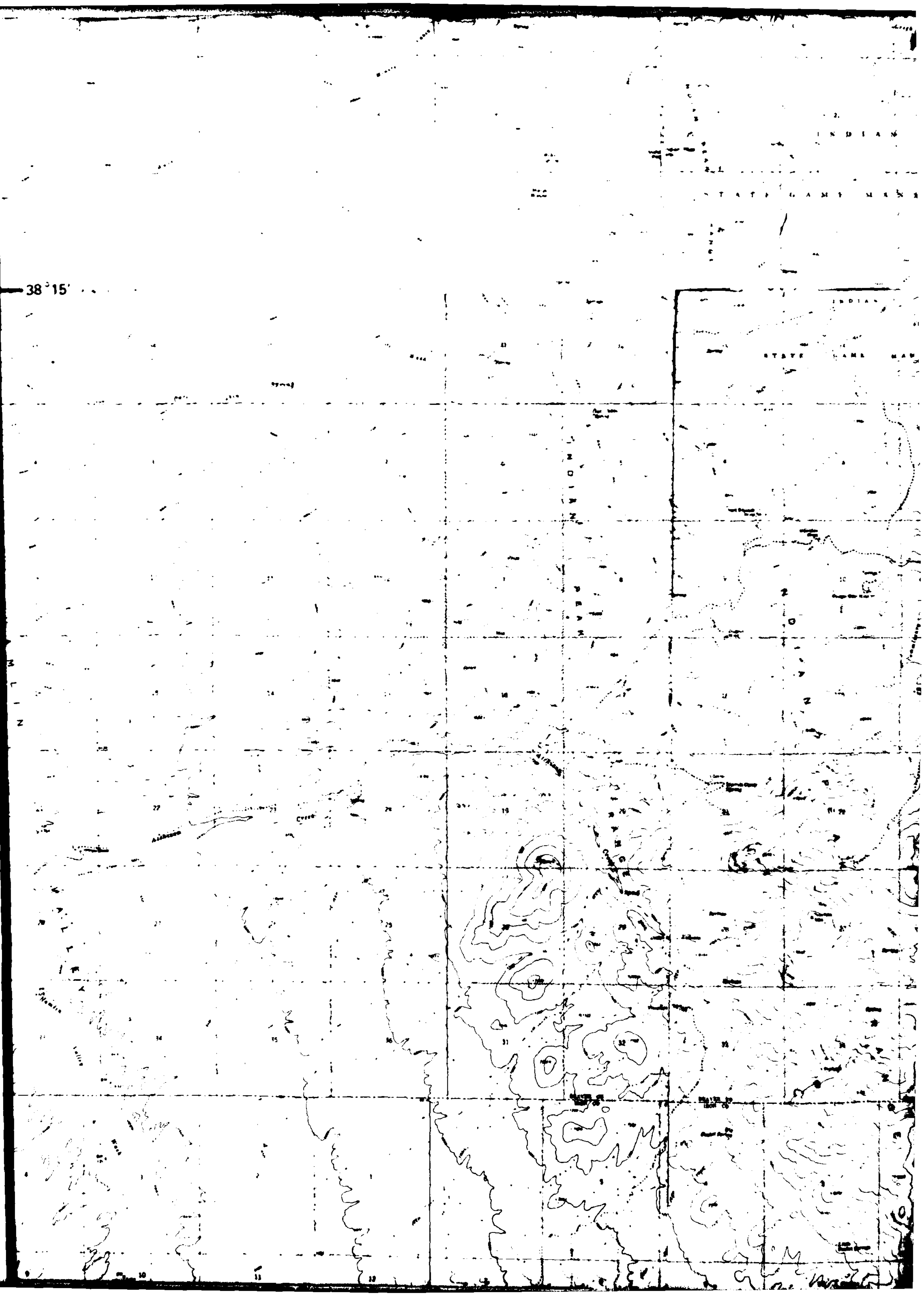
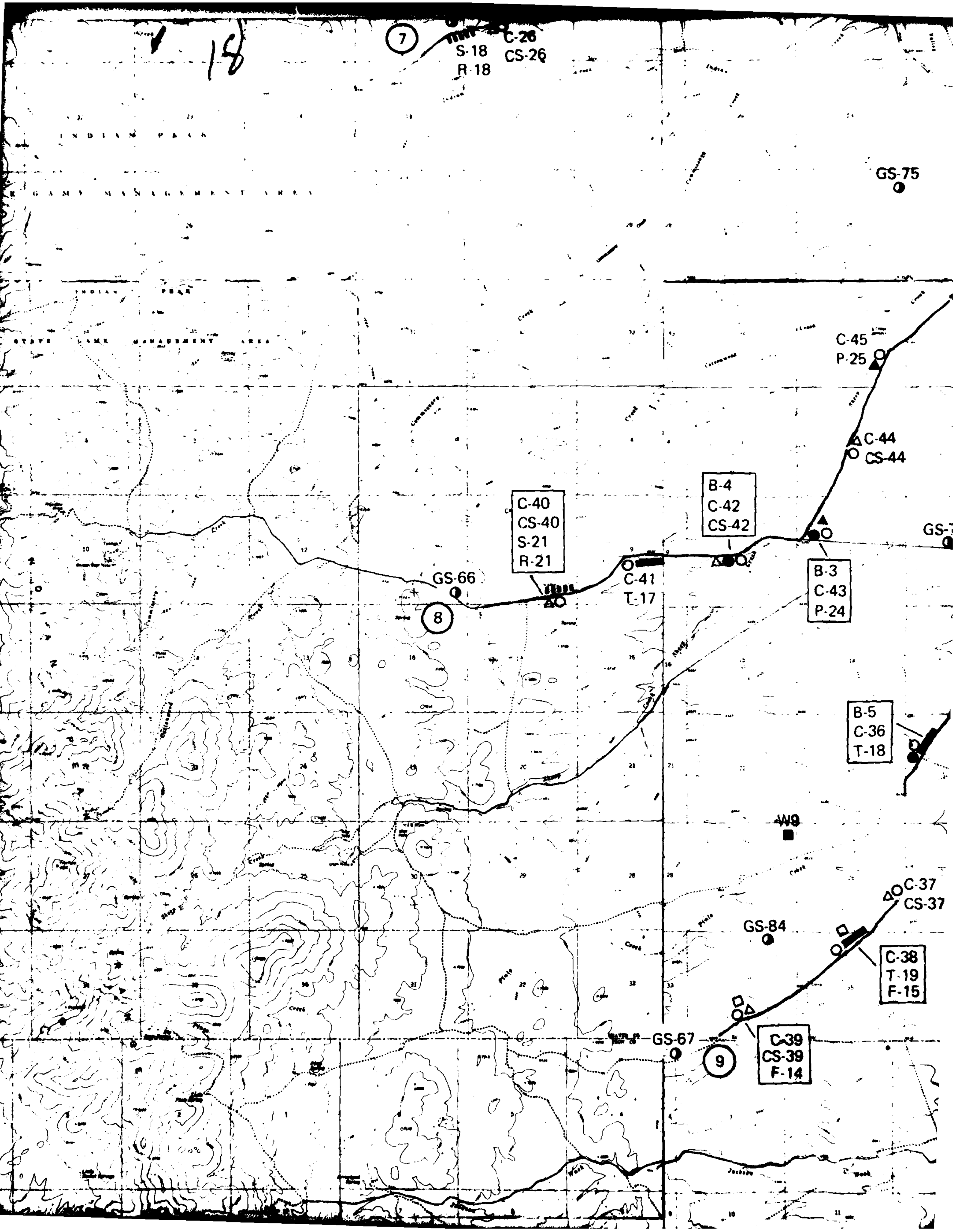
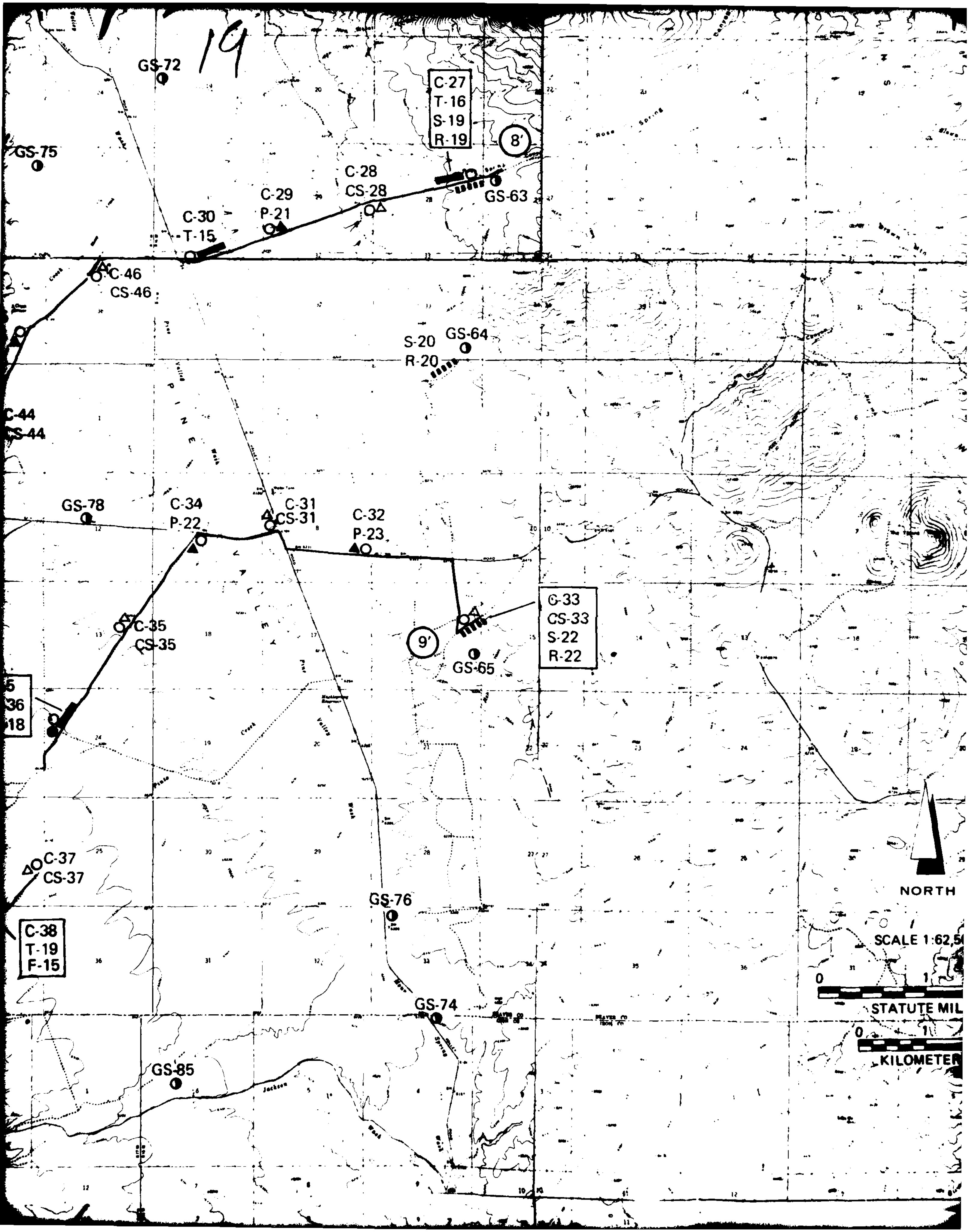
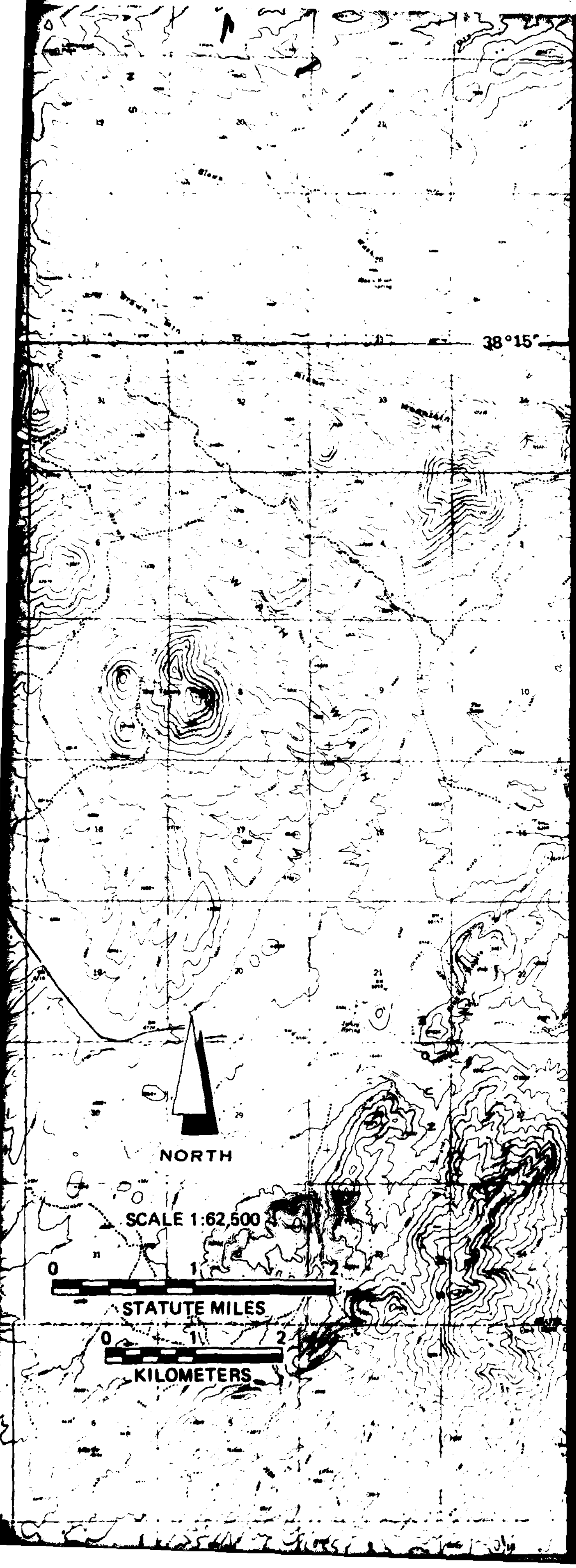



18
7
C-26
S-18
CS-26
R-18
GS-75
C-45
P-25
C-44
CS-44
B-4
C-42
CS-42
C-40
CS-40
S-21
R-21
GS-66
8
C-41
T-17
B-3
C-43
P-24
B-5
C-36
T-18
W9
C-37
CS-37
GS-84
C-38
T-19
F-15
C-39
CS-39
F-14
GS-67
9



19
GS-72
C-27
T-16
S-19
R-19
8'
GS-75
C-28
CS-28
GS-63
C-29
P-21
C-30
T-15
C-46
CS-46
S-20
R-20
GS-64
C-44
CS-44
PINE VALLEY
GS-78
C-34
P-22
C-31
CS-31
C-32
P-23
C-33
CS-33
S-22
R-22
9'
GS-65
C-35
CS-35
5
36
18
C-37
CS-37
C-38
T-19
F-15
GS-76
GS-74
GS-85
NORTH
SCALE 1:62,5
0
1
STATUTE MIL
0
1
KILOMETER



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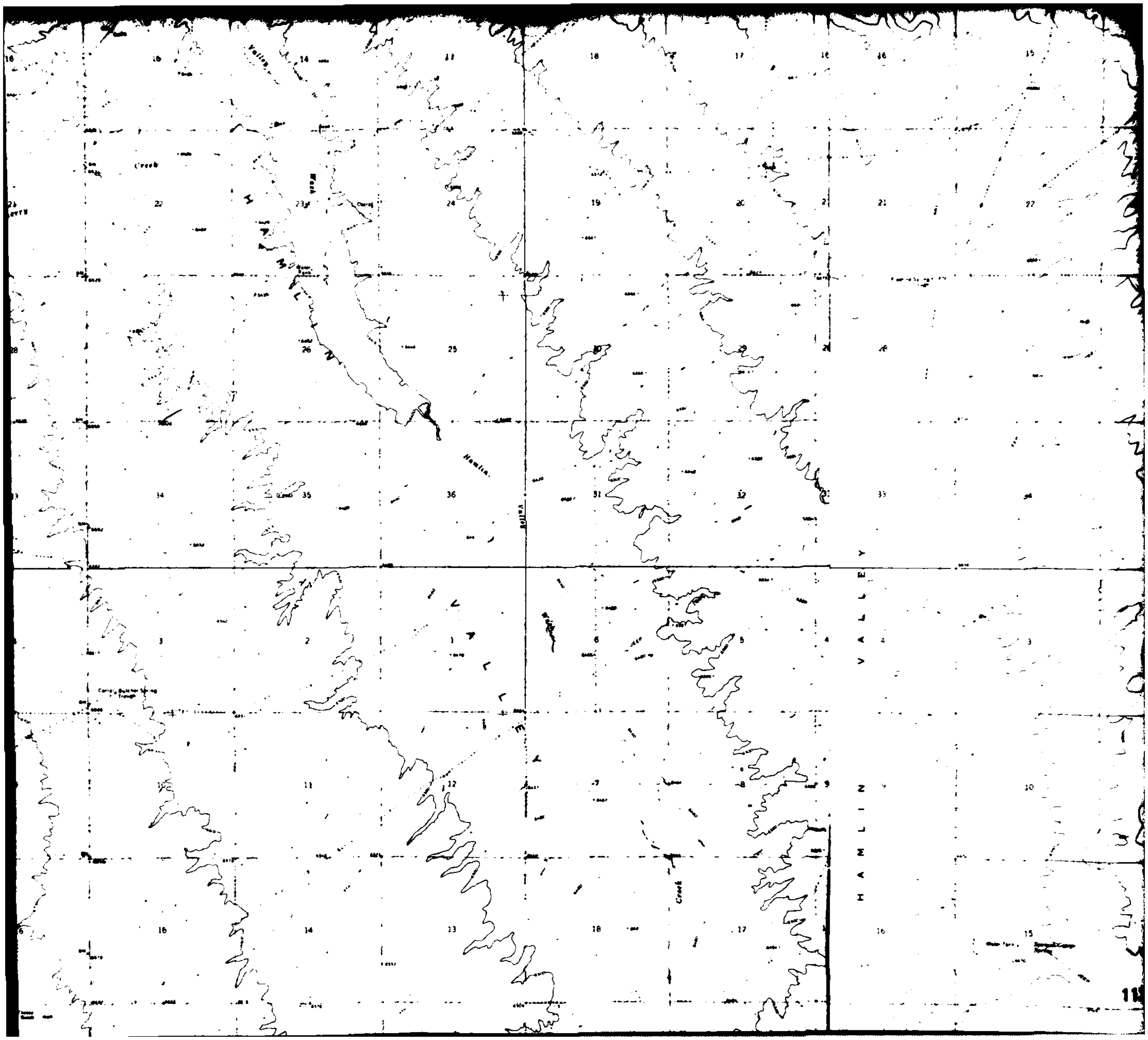
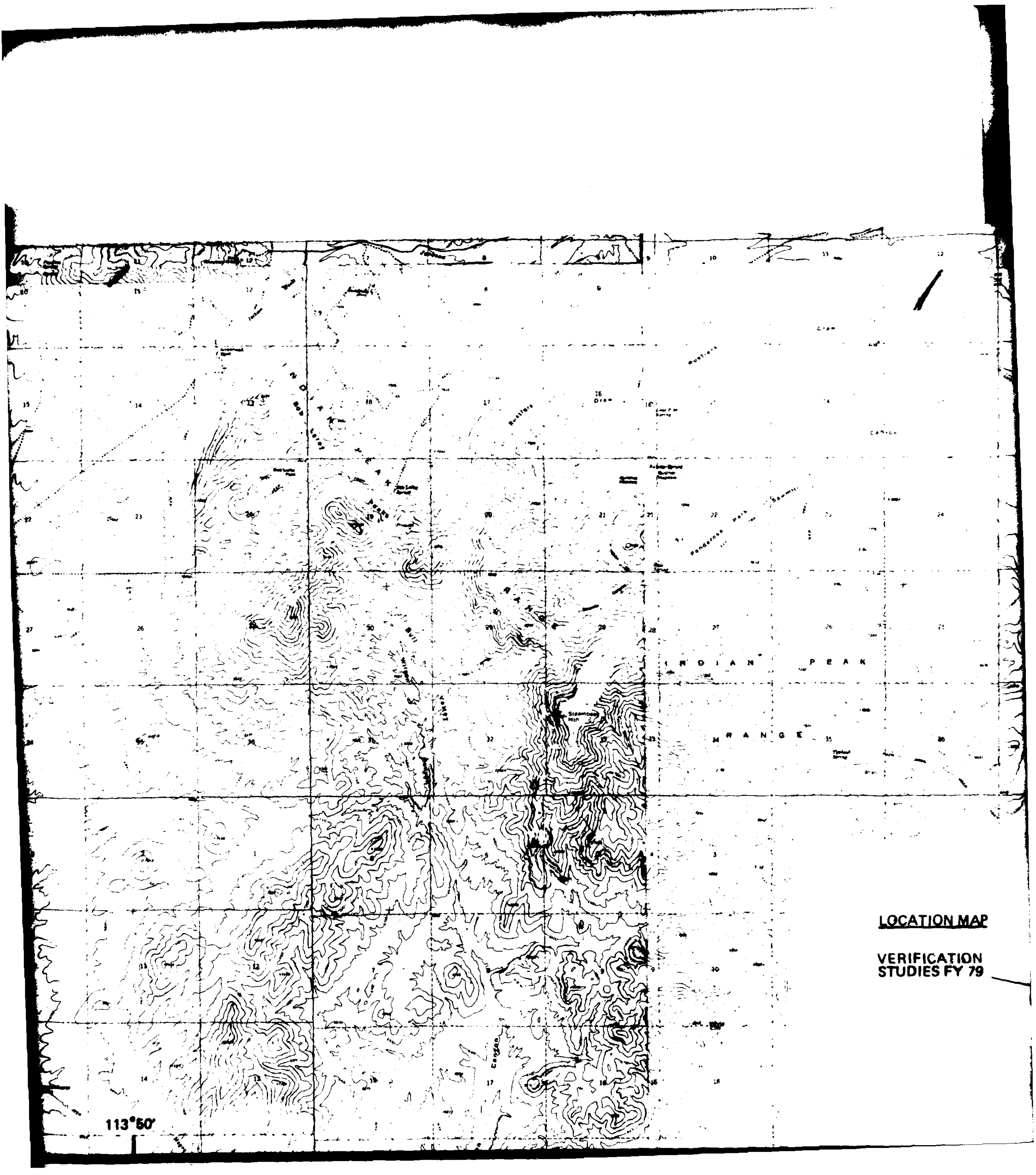
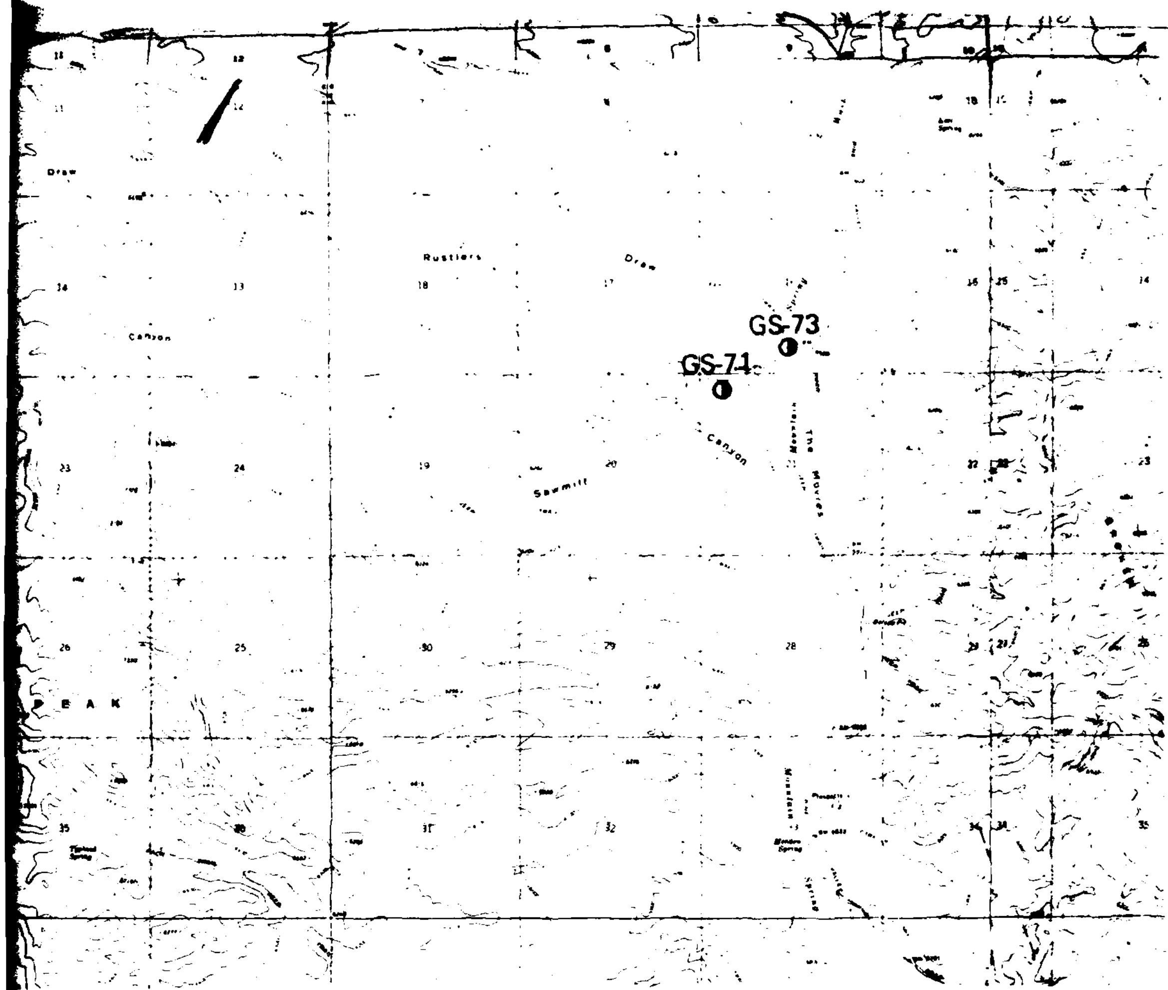


HAMLIN VALLEY
Hamlin
Valley
Wash
Creek
Creek



LOCATION MAP

VERIFICATION STUDIES FY 79



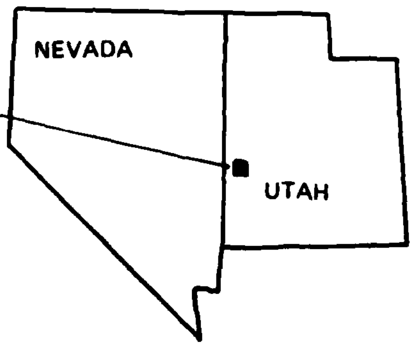
EXPLANATIO

◑	GS-1	GEOL
■	W1 WR	GROU
●	B-1	BORI
	C-1	CONE
△	CS-1	SURF
▬	T-1	TREN
▲	P-1	TEST
▪▪▪▪▪	S-1 R-1	SEIS ELEC
□	F-1	FIEL (CBR
(1)—(1')		ACTI

NOTE: Due to the exaggeration of th combination of activities is w is situated. Single activities a the symbol.

LOCATION MAP

VERIFICATION STUDIES FY 79



ACTIVITY L PINE VAL

MX SITING INVESTI

DEPARTMENT OF THE AIR

FUGRO NA

EXPLANATION

GS-1	GEOLOGIC STATION
W1 WR	GROUND WATER LEVEL MEASUREMENT
B-1	BORING
C-1	CONE PENETROMETER TEST (CPT)
CS-1	SURFICIAL SOIL SAMPLE
T-1	TRENCH
P-1	TEST PIT
S-1 R-1	SEISMIC REFRACTION LINE ELECTRICAL RESISTIVITY LINE
F-1	FIELD CALIFORNIA BEARING RATIO (CBR) TEST
1'	ACTIVITY LINE

NOTE: Due to the exaggeration of the map symbols, the exact location of any combination of activities is where either the boring (1st) or the CPT (2nd) is situated. Single activities are most securely located nearest the center of the symbol.

ACTIVITY LOCATION MAP
PINE VALLEY, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE – BMO

DRAWING
II-1-1

FUGRO NATIONAL, INC.

1 24

N.D.

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